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A COMPUTER PROGRAM FOR CALCULATING MODEL PLANETARY ATMOSPHERES

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ABSTRACT

A computer program is described which provides calculations for model atmospheres to one planetary radius above the surface using the hydrostatic equation and the equation of state. These calculations are based upon a temperature and molecular weight structure and upon the surface pressure, surface gravity, and radius of the planet.

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SUMMARY

The computer program presented here enables calculations to be made of a model atmosphere of a planet to one planetary radius above the surface. The variables calculated are altitude, temperature, pressure, density, specific weight, molecular weight, pressure scale height, density scale height, number density, mean particle velocity, mean free path, collision frequency, speed of sound, coefficient of viscosity, kinematic viscosity, and columnar mass. The calculations are usually made for atmospheres consisting of nitrogen, carbon dioxide, oxygen, argon, neon, hydrogen, helium, water vapor, carbon monoxide, and sulfur dioxide. However, if the printouts of mean free path, collision frequency, coefficient of viscosity, and kinematic viscosity are ignored, calculations may be made for gases of any desired molecular weight.

INTRODUCTION

The model atmosphere, a simplified mathematical construct, offers a self-consistent method for numerically expressing the state of an atmosphere based upon a temperature and molecular weight structure and certain boundary conditions at the surface (for example, surface pressure). Such models are widely used as a scientific tool to enable the investigator to understand physical processes in an atmosphere, for design and conduct of scientific experiments (both remote sensor and in situ), for spacecraft design (for example, reentry), for calculating mission profiles for spacecraft (for example, orbital lifetimes), and for aircraft design.

New data from satellites and sounding rockets and from new theoretical models are continually increasing our understanding of the Earth atmosphere. Thus, the model atmospheres must be updated continuously. A similar situation exists with other planetary atmospheres; however, the amount of data is more scarce and the model atmospheres are more divergent. Consequently, advances in understanding of planetary atmospheres occur more often and offer more extensive changes than for the Earth atmosphere.

In the past, model atmospheres have usually been calculated by hand. This resulted in only the minimum amount of data being given, usually in only one set of units.

When new data were obtained, there was a great deal of time lost calculating a new model atmosphere, and the new atmosphere did not promote good understanding and communication between the scientific and engineering communities. The use of the computer helps solve all of these problems, with the additional advantage of having higher accuracy and greater reliability.

A Fortran computer program was written so that model atmospheres may be calculated easily and quickly, thus reducing the lag time between the receipt of new data and the use of the new model atmospheres. This program was written in the Fortran V computer language for the Univac 1108. However, the program is compatible with Fortran IV for the IBM 7094, and may be easily modified into Fortran II if desired, by changing the input-output and library functions (for example, cos would be changed to cos f). Computational time per model atmosphere is usually less than 30 seconds.

The model atmospheres may be calculated to one planetary radius; however, usually 1000 km or so suffices for most orbital decay and entry studies. Two systems of units (metric and English) are used, and the models calculated are separate but equivalent model atmospheres designed to promote cooperation between different professions. The legend of the scientific and engineering units for the model atmospheres is presented in table I. Since some confusion arises at times concerning pressure scale height and density scale height, an explanation is included in appendix A.

To date, the principal uses of this program have been to calculate model atmospheres for Mars and Venus (ref. 1) and to calculate density and temperature dispersion data for Apollo spacecraft reentry considerations.

SYMBOLS

C_n specific heat at constant pressure, cal mole -1 °K -1

 C_s speed of sound, m sec⁻¹

 C_v specific heat at constant volume, cal mole $^{-1}$ $^{\circ}K^{-1}$

erf(x) error function of
$$x = \frac{2}{\sqrt{\pi}} \int_{X}^{\infty} e^{-\xi^{2}} d\xi = \frac{2}{\sqrt{\pi}} \left(\int_{0}^{\infty} e^{-\xi^{2}} d\xi - \int_{0}^{X} e^{-\xi^{2}} d\xi \right)$$

 $=1-\frac{2}{\sqrt{\pi}}\int_0^X e^{-\xi^2} d\xi$

g acceleration caused by gravity, cm sec -2

surface gravity, cm sec⁻² g_{0} H geopotential altitude above the surface of the planet, km Ha an altitude in geopotential height, km H_h an altitude in geopotential height where $H_b > H_a$, km $H_{\mathbf{D}}$ pressure scale height, km $\overline{\mathbf{H}}_{\mathbf{D}}$ average pressure scale height, km H_{o} density scale height, km Boltzmann constant, ergs (°K)⁻¹ K L mean free path, m columnar mass, g cm⁻² M_{c} molecular weight m m_a molecular weight at Ha molecular weight at Hh $m_{\mathbf{b}}$ m_{i} molecular weight of ith constituent m_j molecular weight of jth constituent m_o base molecular weight Avogadro's number, 6.0238×10^{23} molecules (mole)⁻¹ Ν number density, cm⁻³ n P pressure Pa pressure at Ha, mb pressure at H_b where $H_b > H_a$, mb $\mathbf{P}_{\mathbf{b}}$

P pressure at zero height, mb

Q kinematic viscosity, ft² sec⁻¹

R universal gas constant = 8.314×10^7 ergs mole⁻¹ °K⁻¹

 R_{Z} height of the base of the exosphere plus radius of the planet, km

r the radius of the planet, km

T temperature (kinetic), °K

 T_a temperature at H_a , ${}^{\circ}K$

T_b temperature at H_b, °K

 T_{m} molecular scale temperature, $\frac{T_{m}}{m}$, K

 $\left(T_{m}\right)_{a}$ molecular scale temperature at H_{a} , K

 $\left(T_{m}\right)_{b}$ molecular scale temperature at H_{b} , K

T temperature at zero height, °K

V mean particle velocity, m sec⁻¹

X, mole fraction of the ith constituent

 $y \frac{R_{Z}}{r + Z}$

Z geometric altitude above the surface of the planet, km

 $\alpha \qquad \qquad \frac{R_{Z}}{H_{I}}$

 γ $\frac{C_{p}}{C_{v}}$

 ϵ maximum energy of attraction, ergs

```
\eta_i viscosity for ith constituent, kg m<sup>-1</sup> sec<sup>-1</sup>
```

$$\mu$$
 viscosity for mixture, kg m⁻¹ sec⁻¹

$$\xi$$
 dummy variable used for computation of the error function

$$\rho$$
 density, g cm⁻³

$$\sigma_{f i}$$
 zero energy collisional diameter for the ith constituent, Å

$$\Omega_{\mathbf{i}}(\mathbf{T})$$
 reduced collisional integral for ith constituent

$$\omega$$
 specific weight, slug ft⁻² sec⁻²

Subscripts:

CALCULATION OF A MODEL ATMOSPHERE

The atmosphere and its variations above the surface of a planet can be described by the use of six variables: density ρ , pressure P, temperature T, molecular weight m, acceleration caused by gravity g, and height Z. There are two equations which relate these quantities. The equation of state, shown in equation (1), which is a form of the ideal gas law, relates P, ρ , T, and m to the universal gas constant R.

$$\rho = \frac{\mathrm{Pm}}{\mathrm{RT}} \tag{1}$$

The hydrostatic equation, shown in equation (2), relates the pressure gradient to the density and the local value of gravity.

$$\frac{\partial \mathbf{P}}{\partial \mathbf{Z}} = -\rho \mathbf{g} \tag{2}$$

The proper combination of the ideal gas law equation and the hydrostatic equation with certain reasonable and valid assumptions results in equations (3) and (4). A more comprehensive derivation of equations (3) and (4) can be found in appendix B. If $\partial T_{\mathbf{m}}/\partial \mathbf{H} \neq \mathbf{0}$, then

$$P_{b} = P_{a} \left[\frac{\left(T_{m}\right)_{b}}{\left(T_{m}\right)_{a}} \right]^{R} \frac{\frac{g_{o}^{m}_{o}}{\partial H}}{\partial H}$$
(3)

and, if $\partial T_m/\partial H = 0$, then

$$P_b = P_a \exp \left[\frac{-g_o^m_o (H_b - H_a)}{R(T_m)_a} \right]$$
 (4)

If the surface boundary conditions (g_0, m_0, P_0, T_0) and the molecular scale temperature structure are known, the pressure as a function of height may be calculated by equations (3) and (4) and the density may be calculated by substitution into equation (1). Typical construction parameters required for use in equations (3) and (4) are given in table II. The values given are for Mars, whereas the appropriate values for any other planet may be selected.

In the calculation of some model atmospheres the temperature and molecular weight structure are the primary variables and are chosen accordingly. In this case, the molecular scale temperature gradient $\partial T_m/\partial H$ is a derived quantity each geometric km. In other words, if molecular weight and temperature are input in linear segments, then molecular scale temperature is not linear with altitude, but is curved. For this case, temperature is calculated by

$$T_b = T_a + \frac{\partial T}{\partial H} \left(H_b - H_a \right)$$
 (5)

molecular weight is calculated by

$$m_b = m_a + \frac{\partial m}{\partial H} (H_b - H_a)$$
 (6)

molecular scale temperature is calculated by

$$\left(T_{\mathbf{m}}\right)_{\mathbf{b}} = \frac{\mathbf{m}_{\mathbf{0}} T_{\mathbf{b}}}{\mathbf{m}_{\mathbf{b}}} \tag{7}$$

and

$$\frac{\partial T_{m}}{\partial H} = \frac{\left(T_{m}\right)_{b} - \left(T_{m}\right)_{a}}{H_{b} - H_{a}} \tag{8}$$

¹The temperature structure is defined by a number of temperatures and molecular weights corresponding to an altitude, either geometric or geopotential as desired. The number of these critical points cannot exceed 99.

In this option the geometric altitude is generated and then is converted into geopotential altitude, which is subsequently used to generate pressure and temperature. This is known as option 1 and is the option usually used for Mars. Table III contains the output for such a model, using the construction parameters shown in table II.

Option zero molecular scale temperature gradients and the temperature gradients may be considered to be the primary variables; in such circumstances, they are taken in linear segments. In this case, molecular weight is the derived quantity which is therefore not linear in altitude. This method is used in calculating models of the type such as the U.S. Standard Atmosphere (ref. 2), and is known as option zero.

For option zero, molecular scale temperature is calculated by

$$(T_{\rm m})_{\rm b} = (T_{\rm m})_{\rm a} + \frac{\partial T_{\rm m}}{\partial H} (H_{\rm b} - H_{\rm a})$$
 (9)

temperature is calculated by

$$T_{b} = T_{a} + \frac{\partial T}{\partial H} \left(H_{b} - H_{a} \right) \tag{10}$$

and molecular weight is calculated by

$$m_{b} = \frac{m_{o}T_{b}}{\left(T_{m}\right)_{b}} \tag{11}$$

Table IV contains the output for a sample calculation of this option. The choice of options is left to the discretion of the programer.

At very high altitudes, when the scale height of the atmosphere is approximately equal to the mean free path of the gas molecules, the atmosphere no longer behaves hydrostatically. In order to account for this change in the rate of decay of density with height (the decay rate is less rapid), an analytical expression for a neutral exosphere is used (ref. 3). The following equation describes the density in an exosphere in terms of the density at the base of the exosphere.

$$\rho(Z) = \rho_{O}(R_{Z}) \left[e^{-\alpha (1-y)} \left(1 - \frac{1}{2} \operatorname{erf} \sqrt{\alpha y} \right) - \left(\sqrt{1 - y^{2}} \right) \left(e^{-\frac{\alpha}{1+y}} \right) \left(1 - \frac{1}{2} \operatorname{erf} \sqrt{\frac{\alpha y}{1+y}} \right) - \left(\sqrt{\frac{\alpha y}{\pi}} \right) \left(1 - \sqrt{1-y} \right) e^{-\alpha} \right]$$

$$(12)$$

The use of the exosphere option in the computer program also is left to the discretion of the programer.

When P, T, and ρ are known for the 1-km geometric height increment, additional quantities can be calculated in tabular form according to the following formulas, many of which were used in the U.S. Standard Atmosphere, 1962 (ref. 2). However, some formulas must by necessity be more complex in the general case than for the Earth. For these cases, the number of gases for which calculations can be made were restricted to 10 gases: those high in the solar abundance (hydrogen, helium, and neon), those which comprise outgassing because of vulcanism (water vapor, carbon dioxide, sulfur dioxide, nitrogen, carbon monoxide), those caused by the presence of life and/or dissociation of other compounds (oxygen), and those caused by radioactive decay (argon). Thus, in the calculation of the speed of sound, γ is determined from C_p as a function of temperature (ref. 4) for the mixture as chosen from these 10 gases, as is shown in equation (13).

$$C_{S} = \left(\gamma \frac{R}{m} T\right)^{1/2} \tag{13}$$

The surface molecular weight of the mixture is also calculated from the mole fractions of the gases as chosen by the programer.

$$m_{o} = \sum_{i=1}^{10} X_{i} m_{i}$$
 (14)

In the calculation of the mean free path L and collision frequency υ , the collisional diameter σ used is calculated from these 10 gases as shown in the following equations.

$$\sigma = \sum_{i=1}^{10} X_i \sigma_i \tag{15}$$

$$L = \frac{RT}{2^{1/2} \pi N \sigma^2 P}$$
 (16)

$$v = 4\sigma^2 N \left(\frac{\pi}{R}\right)^{1/2} \frac{P}{(T)^{1/2} m^{1/2}}$$
 (17)

The coefficient of viscosity is calculated, using equations (18) to (20), for an atmosphere composed of these 10 gases. Values of Ω were calculated for each constituent for each 100° K from 100° to 700° K from the nomograms given in reference 5.

$$\mu = \sum_{i=1}^{10} \frac{\eta_i}{\left(1 + \sum_{\substack{j=1 \ j \neq i}}^{10} \Phi_{ij} \frac{X_j}{X_i}\right)}$$
(18)

$$\eta_{i} = 26.693 \left(\frac{1}{\sigma^{2}} \sqrt{\frac{m\epsilon}{K}} \right) \left[\frac{\sqrt{KT/\epsilon}}{\Omega_{i}(T)} \right]$$
(19)

$$\Phi_{ij} = \frac{\left[1 + \left(\frac{\eta_{i}}{\eta_{j}}\right)^{1/2} \left(\frac{m_{j}}{m_{i}}\right)^{1/4}\right]^{2}}{2\sqrt{2}\left(1 + \frac{m_{i}}{m_{j}}\right)^{1/2}}$$
(20)

The remaining equations, for calculation of mean particle velocity, specific weight, pressure scale height, density scale height, number density, columnar mass, and kinematic viscosity are as follows.

$$V = \left(\frac{8RT}{\pi m}\right)^{1/2} \tag{21}$$

$$\omega = \rho g \tag{22}$$

$$H_{\mathbf{p}} = \frac{\mathbf{RT}}{\mathbf{mg}} \tag{23}$$

$$H_{\rho} = \frac{H_{P}}{1 + \frac{R}{g} \frac{\partial (T/m)}{\partial Z}}$$
 (24)

$$n = \frac{NP}{RT} \tag{25}$$

$$M_{c} = \int_{0}^{Z} \rho \, dZ \tag{26}$$

$$Q = \frac{\mu}{\rho} \tag{27}$$

The preceding equations, (3) to (27), were programed so that a model atmosphere can be constructed with a minimum of construction parameters.

The model atmospheres are printed in tabular form with 16 variables being given as a function of height in increments chosen by the programer; they were all calculated using 1-km steps, however. The variables calculated are altitude, temperature, pressure, density, specific weight, molecular weight, pressure scale height, density scale height, number density, mean particle velocity, mean free path, collision frequency, speed of sound, coefficient of viscosity, kinematic viscosity, and columnar mass.

A Fortran listing for the planetary model atmosphere computer program and an example of input data are shown in appendix C and appendix D, respectively.

FLOW CHART FOR PLANETARY MODEL ATMOSPHERE COMPUTER PROGRAM

Essentially, the first portion of the program through pivot 1 sets up the input data internally and the output headings externally. Pivot 3 is the beginning of the read cycle for the altitude distribution of molecular weight and temperature. Pivot 11 is the beginning of the altitude-iteration ''do'' loop. Pivot 5 is the beginning of the exosphere option. After the pressure, temperature, and density are calculated, the subordinate parameters are determined. Viscosity calculations start near pivot 6 and carry through to pivot 9. Once these subordinate quantities are calculated, printout occurs if the altitude agrees with the altitude increments which were input by the programer. Then corresponding engineering values are calculated. The altitude iteration ends at pivot 12; then the engineering data are printed out. The iteration then returns to pivot 13 and is ready to calculate another model atmosphere. The flow chart is illustrated in figure 1.

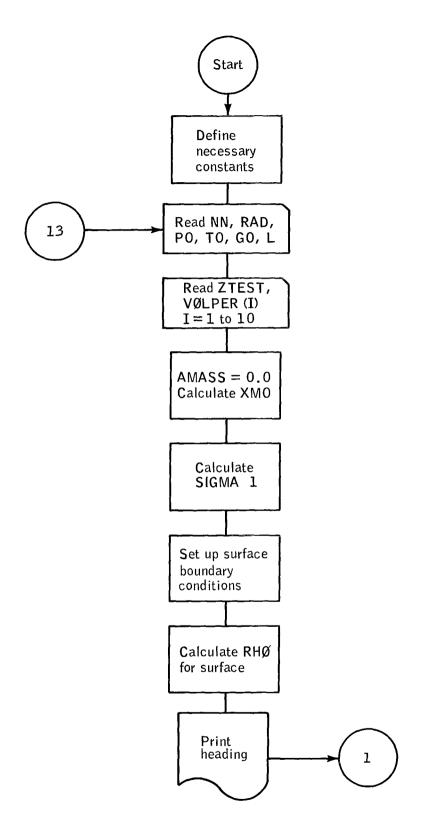


Figure 1. - Flow chart.

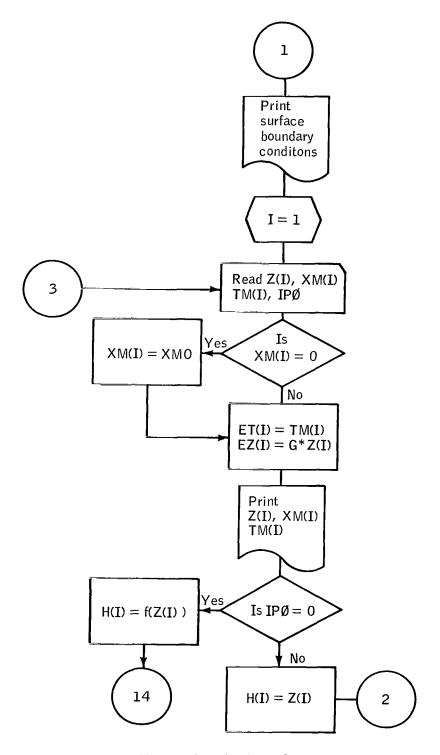


Figure 1. - Continued.

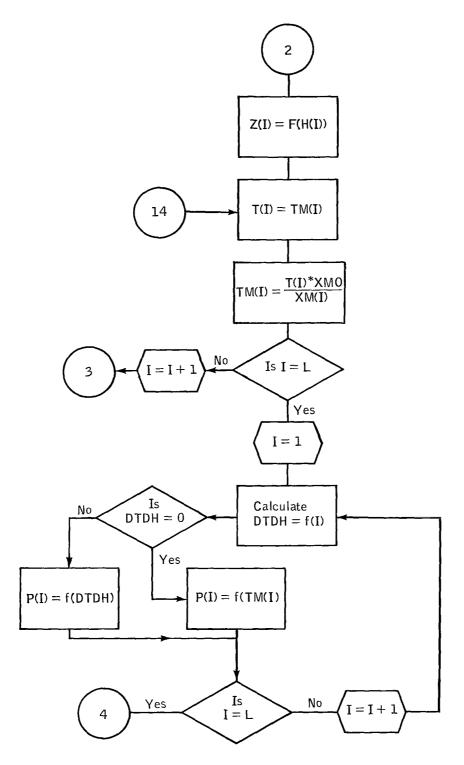


Figure 1. - Continued.

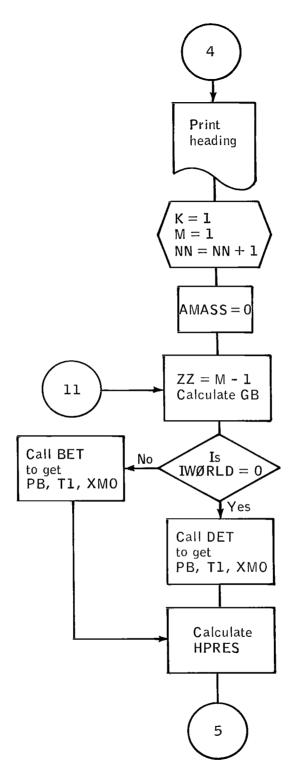


Figure 1. - Continued.

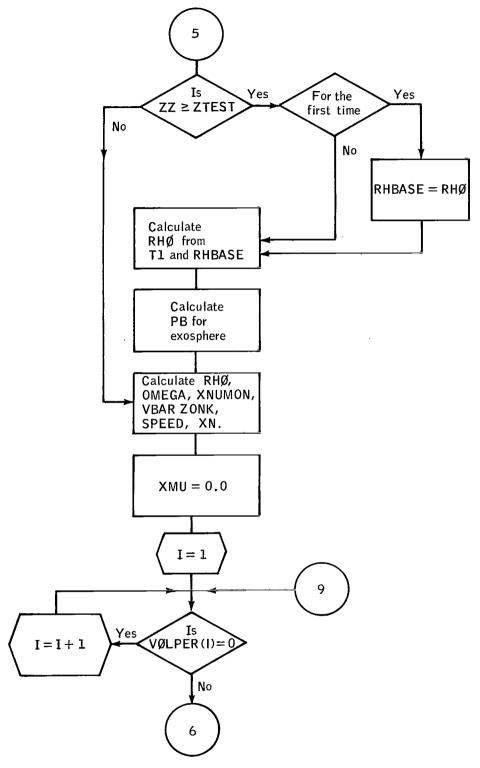


Figure 1. - Continued.

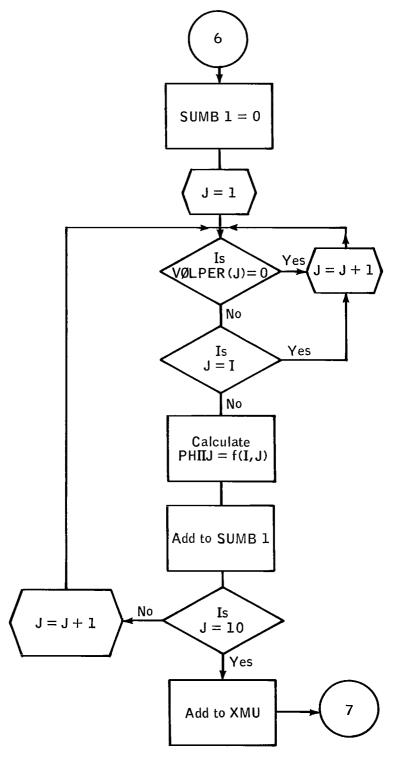


Figure 1. - Continued.

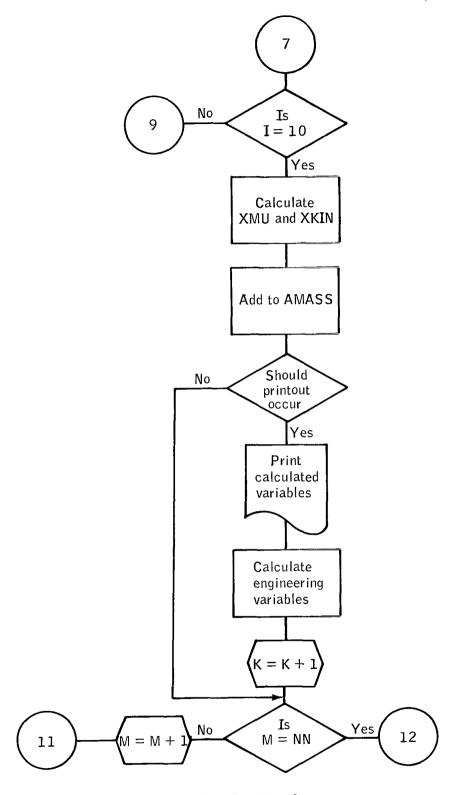


Figure 1. - Continued.

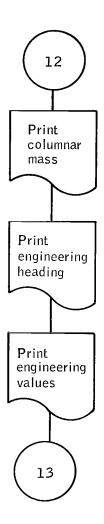


Figure 1. - Concluded.

CONCLUDING REMARKS

Using the computer program just described, wide ranges of model atmospheres may be calculated in order to envelope relatively uncertain conditions in a planetary atmosphere; or, special purpose calculations may be made involving very exact conditions which were measured for a particular location, altitude, and time of day.

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APPENDIX A

PRESSURE AND DENSITY SCALE HEIGHT

Pressure scale height may be defined in many ways. Perhaps the best way is as shown in equation (A1).

$$H_{\mathbf{P}} = \frac{-1}{\frac{1}{\mathbf{P}} \frac{\partial \mathbf{P}}{\partial \mathbf{Z}}} = \frac{-1}{\frac{\partial \ln \mathbf{P}}{\partial \mathbf{Z}}}$$
(A1)

As may be seen in equation (A1), H_P denotes the rate of decrease of pressure with height. Specifically, H_P is the height necessary for the pressure to be reduced by e (that is, $P(Z_{H_P}) = P(base)/e$). This is shown in the following discussion. Combining the hydrostatic equation

$$\frac{\partial \mathbf{P}}{\partial \mathbf{Z}} = -\rho \mathbf{g} \tag{A2}$$

with the equation of state

$$\rho = \frac{Pm}{RT} \tag{A3}$$

gives

$$\frac{1}{P} \frac{\partial P}{\partial Z} = \frac{-mg}{RT} \tag{A4}$$

Substituting equation (A4) into equation (A1) gives the simple result

$$H_{\mathbf{p}} = \frac{RT}{mg} \tag{A5}$$

which is the form of the pressure scale height most commonly found in textbooks.

Combining equations (A4) and (A5) by eliminating the term mg/RT gives

$$-\frac{1}{P}\frac{\partial P}{\partial Z}dZ = \frac{dZ}{H_P}$$
 (A6)

Integrating equation (A6) gives from altitudes a to b

$$\int_{P_a}^{P_b} -\frac{dP}{P} = \int_a^b \frac{1}{H_P} dZ \tag{A7}$$

where b > a gives,

$$\ln \frac{P_a}{P_b} \cong \frac{1}{H_P} \left(Z_b - Z_a \right) \tag{A8}$$

 \mathbf{If}

$$P_{b} = \frac{P_{a}}{e} \tag{A9}$$

then

$$\overline{H}_{P} = \left(Z_{b} - Z_{a}\right) \tag{A10}$$

A hypothetical homogeneous atmosphere ($\nabla \rho = 0$) has a height (where P = 0) equal to the pressure scale height. Even though it is homogeneous, the atmosphere will still be hydrostatic, but since the density is constant, equation (A2) can easily be integrated

$$\frac{\partial \mathbf{P}}{\partial \mathbf{Z}} = -\rho \mathbf{g} \qquad \qquad \mathbf{P}_{\mathbf{b}} - \mathbf{P}_{\mathbf{a}} \cong -\rho \mathbf{g} \left(\mathbf{Z}_{\mathbf{b}} - \mathbf{Z}_{\mathbf{a}} \right)$$
 (A11)

At the top of the atmosphere \mathbf{Z}_{b} , the pressure becomes zero, and at the surface \mathbf{Z}_{a} the pressure has some finite value. Therefore

$$-P_{a} = -\rho g \left(Z_{b} - Z_{a}\right) \tag{A12}$$

However, $Z_a = 0$ since the origin is at the surface so that

$$\frac{P_a}{\rho g} = Z_b \tag{A13}$$

but

$$P = \frac{\rho RT}{m} \tag{A14}$$

so

$$\frac{RT}{mg} = Z_b \tag{A15}$$

Then, using equation (A5),

$$Z_{b} = H_{p}$$
 (A16)

The density scale height is defined in a similar manner

$$H_{\rho} = \frac{-1}{\frac{1}{\rho} \frac{\partial \rho}{\partial Z}} \tag{A17}$$

and may be said to be the height increment required to reduce the density by the factor e. The relation between the two scale heights is

$$H_{\rho} = \frac{H_{P}}{1 + \frac{R}{g} \frac{\partial (T/m)}{\partial Z}}$$
 (A18)

APPENDIX B

DERIVATION OF ITERATIVE HYDROSTATIC EQUATION

The basic equation describing the rate of change of pressure in the lower regions of the atmosphere is the hydrostatic equation. It relates the vertical gradient of pressure to the local values of density and gravity. The tangent plane coordinate system (fig. B-1) is used as a reference for defining direction.

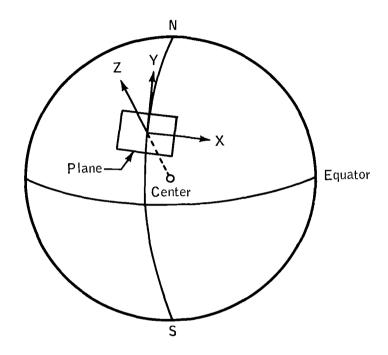


Figure B-1. - The tangent plane coordinate system.

$$\frac{\partial \mathbf{P}}{\partial \mathbf{Z}} = -\rho \mathbf{g} \tag{B1}$$

If density were known as a function of height, equation (B1) would be integrable. However, temperature, not density, is usually the known function in an atmosphere. It is for this reason that the equation of state

$$\rho = \frac{Pm}{RT} \tag{B2}$$

is substituted into (B1), giving

$$\frac{1}{P} \frac{\partial P}{\partial Z} dZ = \frac{-mg}{RT} dZ$$
 (B3)

However, this equation is not integrable as it stands. Three variables m, g, and T are functions of Z. Thus a transformation of variables is required. In order to do this, two hypothetical constructs are used. These are the geopotential altitude and the molecular scale temperature. Geopotential altitude H is a fictitious altitude which changes relative to geometric altitude Z such that g becomes a constant. Geopotential altitude is defined as follows

$$dH = \frac{g}{g_0} dZ$$
 (B4)

The acceleration caused by gravity near a spherically symmetric planet is expressed by Newton's law of universal gravitation, which, when placed in terms of the gravitational acceleration at the surface of the planet, becomes

$$g = \frac{g_0 r^2}{(r+Z)^2}$$
 (B5)

Using this result in equation (B4) and integrating gives

$$H = r^2 \int_0^Z \frac{dZ}{(r+Z)^2} = \frac{Zr}{r+Z}$$
 (B6)

Likewise, molecular scale temperature T_{m} is simply a device for combining two variables (T and m) into one. It is defined as

$$T_{m} = \frac{m_{o}}{m} T \tag{B7}$$

If equations (B4) and (B7) are substituted into equation (B3) it becomes

$$\frac{1}{P} \frac{\partial P}{\partial Z} dZ = \frac{-m_0 g_0 dH}{RT_m}$$
 (B8)

Within an atmospheric layer where $\partial T_m/\partial H$ is constant, then equation (B8) has an exact analytic solution, which is as follows. If $\partial T_m/\partial H \neq 0$

$$P_{b} = P_{a} \begin{bmatrix} {T_{m}}_{b} \\ {T_{m}}_{a} \end{bmatrix}^{\frac{g_{o}^{m}_{o}}{R \frac{\partial T_{m}}{\partial H}}}$$
(B9)

and if $\partial T_m / \partial H = 0$

$$P_{b} = P_{a} \exp \left[\frac{-g_{o}^{m} o \left(H_{b} - H_{a}\right)}{R(T_{m})_{a}} \right]$$
(B10)

These are the final iterative forms of calculating pressure as a function of altitude.

APPENDIX C

FORTRAN LISTING FOR THE PLANETARY MODEL

ATMOSPHERE COMPUTER PROGRAM

Because the description of the computer program is included in the flow chart, it will not be duplicated here. The Fortran listing and a key to the variables are included for those who wish to inquire into the mechanics of the program further than the flow chart allows. Although the key does not explain all of the variables, it does include the most important ones. Many of the variables not included are ''dummy' variables and are of no consequence, since they are used only as tools for operations such as numerical integration. Variables that have an "E" preceding them are in engineering units. The following is an explanation of the notation used in the program.

AM molecular weight of each of the 10 constituents

AMASS quantity used to sum $\rho_i \Delta z_i$ over all i's for columnar mass

BET subroutine for calculation of pressure where the temperature gradi-

ent is the primary variable

CARBØN columnar mass of CO₂

CCPP $C_{p}(T1)$

CCVV $C_{v}(T1)$

CP C_p for each of the 10 constituents for each 100° K from 100° to 700° K

CPS function for calculation of C_{p}

DA, TE the month, date, and year of the computer run

DET subroutine for calculation of pressure where molecular scale temper-

ature lapse rate is the primary variable

DMDH molecular weight gradient at ZZ, geopotential

DTDZ molecular scale temperature gradient, geometric altitude

GAMMA C_{p}/C_{v}

GB acceleration caused by gravity at ZZ

GO acceleration caused by gravity at the surface of the planet

H (I) geopotential altitude of Ith level

HPRES pressure scale height

HRHØ density scale height

IENDG number of total levels to be printed out in the engineering quantities

IFLIP altitude interval of printout above KFLIP and below KFLØP

IFLØP altitude interval of printout above KFLØP and below KSLØP

III designation of which constituent is being used

INF, QOOOFL variables used for random alpha-numeric information to be printed

on output sheet

IPØ a code for the programer to make input values of altitude either geo-

metric (IP \emptyset = 0) or geopotential (IP \emptyset = 1)

IQF dummy variable for setting up arrays

ISL\(\text{P} \) altitude interval of printout above KSL\(\text{P} \)

IWØRLD a code to enable the programer to choose between a subroutine for

calculating model atmospheres similar to the U.S. Standard, 1962, called DET ($IW\emptyset RLD = 0$) and a subroutine for most planetary at-

mospheres called BET (IWØRLD = 1)

K index used for engineering variables

KFLØP geometric altitude above which the altitude interval IFLØP is used

KLIP geometric altitude above which the altitude interval IFLIP is used

KSLØP geometric altitude above which the altitude interval ISLØP is used

L the ratio of the number of linear temperature segments to the number

of altitude segments considered

M fixed point variable for geometric altitude

NA, ME name of the planet or celestial body being considered

NN the maximum height to be considered

 \emptyset M Ω for each of the 10 constituents for each 100° K from 100° to 700° K

ØMEG function for calculation of Ω for viscosity

ØMEGA specific weight

PB pressure at the top of the interval of integration

PHI π

PHIIJ coefficient for calculating viscosity

P (I) pressure at the Ith level

PO surface pressure

RAD radius of planet

RAT $\frac{\epsilon}{K}$ for each of the 10 constituents

RGM an alpha-numeric variable corresponding with IPØ. If altitude being

read in is geometric, RGM = M; if geopotential, RGM = P. Thus

either "GEØM" or "GEØP" is printed out.

RHBASE density at the base of the exosphere

RHØ density

RO universal gas constant

SIGMA zero energy collision diameter for each of the 10 constituents, Å

SIGMA 1 average zero energy collisional diameter

SPEED speed of sound

T1 temperature

T (I) kinetic temperature at the Ith level, read-in

TM (I) molecular scale temperature for the Ith level

TMQ molecular scale temperature at ZZ

TMQ1 molecular scale temperature at altitude XH1

TO surface temperature

TQ temperature at ZZ

VBAR mean particle velocity

VI function for calculation of viscosity

VØLPER (1) mole fraction of nitrogen

VØLPER (2) mole fraction of carbon dioxide

VØLPER (3) mole fraction of oxygen

VØLPER (4) mole fraction of argon

VØLPER (5) mole fraction of neon

VØLPER (6) mole fraction of hydrogen

VØLPER (7) mole fraction of helium

VØLPER (8) mole fraction of water

VØLPER (9) mole fraction of carbon monoxide

VØLPER (10) mole fraction of sulfur dioxide

VIS $\frac{1}{\sigma^2} \sqrt{\frac{m\epsilon}{K}}$ for each of the 10 constituents

XERR dummy variable

XH geopotential altitude

XH1 geopotential altitude corresponding to 1 geometric km below ZZ

XK 1.38026 × 10^{-16} ergs (°K)⁻¹

XKIN kinematic viscosity

XM (I) molecular weight for the Ith level, read-in

XMO molecular weight

XMØLW surface molecular weight

XMQ molecular weight at ZZ

XMQ1 molecular weight 1 geometric km below present level

XMU coefficient of viscosity

XN Avogadro's number

XNU collision frequency

XNUMD number density

XRHØ density at 1 geometric km below present level

YERR dummy variable

Z (I) geometric altitude of Ith level

ZØNK mean free path

ZTEST altitude of the base of the exosphere

ZZ geometric height

APPENDIX D

EXAMPLE OF INPUT DATA

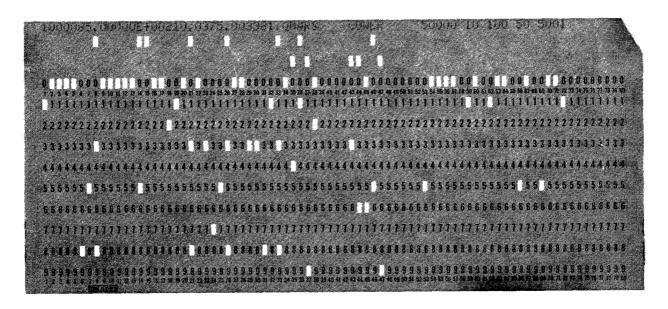
An example of input data for a sample Mars model atmosphere is given on the following pages. The data are also explained in the tabulated key, shown after the example.

Each model atmosphere needs one each of cards 1 and 2. The first two cards determine the extent in altitude of the calculations, the surface boundary conditions, the altitude increments desired, the mole fraction of each of the 10 gases, the calculation procedure to be used for pressure, and the altitude at which the exospheric option is to be used (if it is to be used at all). The number of type 3 cards that will be used depends upon the model atmosphere. However, the temperature and molecular weight must be given at least to the maximum number of levels (km) as specified by card number 1.

KEY TO EXAMPLE OF INPUT DATA

Card 1

Number of levels km, number of card 3 to be read in, surface pressure mb, surface temperature ${}^{\circ}K$, surface gravity cm sec ${}^{-2}$, radius of planet km, planet name, comments, first increment, first altitude, second increment, second altitude, third increment, third altitude, test for type of model: U.S. Standard (IWØRLD = 0), planet (IWØRLD = 1).



Card 1

Card 2

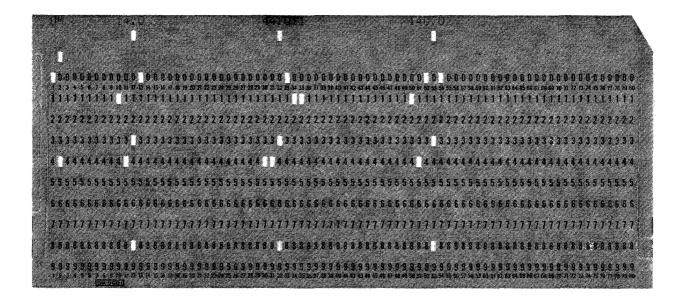
Date, height of the base of the exosphere km, mole fraction of nitrogen, mole fraction of carbon dioxide, mole fraction of oxygen, mole fraction of argon, mole fraction of neon, mole fraction of hydrogen, mole fraction of helium, mole fraction of water, mole fraction of carbon monoxide, mole fraction of sulfur dioxide.

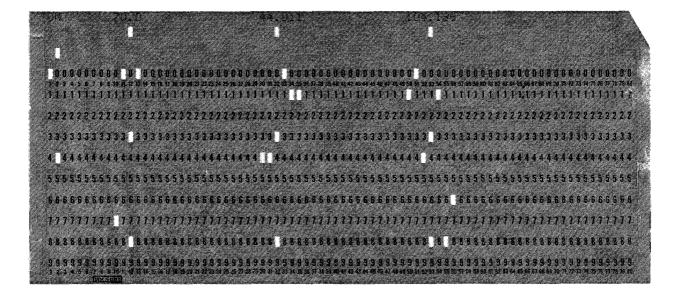
	The production of the U.S. Street of the Control of
1 2 3 4 5 6 7 8 8 40 41 72 10 74 15	0 1
	2221212121212121212121212121212121212121
	133 3333 3333 3133 3338 3333 3333 3333
	555555555555555555555555555555555555555
	77777777777777777777777777777777777777
	999139913939393939399399999993933333333

Card 2

Card 3

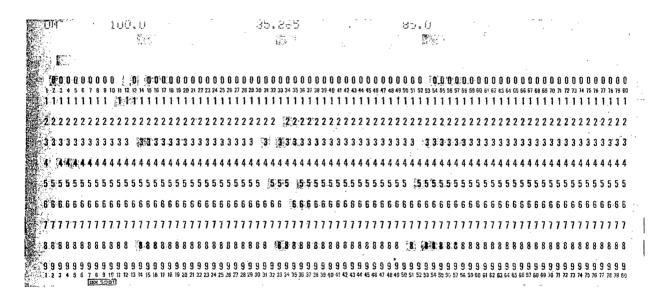
Test for altitude (zero if geometric, one if geopotential), alphabetic variable (''M'' if geometric, ''P'' if geopotential), and altitude km, molecular weight (g/g mole), temperature °K.





Card 3

Card 3 - Continued.



Card 3 - Continued.

Card 3 - Concluded.

CDAV	UMNAR MASS MODEL ATMOSPHERE WITH VAR OF MOL WTG, EXOSPHERE
	- promoton -/oo/ ET/Oo). H(Oo), TM(90), VM(90); P(Y0// E//
	106. 677,564. 671,081. EDD(251. FRHD(201. ESPEED(401.) EDF
	- ^^E_\
	3EXKIN(251), EOMEGA(251), T(90), VOLPER(10), SIGMA(10), VIS(10), RAT(1
	4 10440
	COMMON H, TM, XM, P, GO, RAD, L, RO, XMOLW, T, TMQ1, XH1, XMQ1, P1, VIS, RAT, AM
	VI(T1: III: IQF) = 26.693 + VIS(III) + SQRT(T1/RAT(III))/(OMEG(T1: III: IG
	1)
	T1=200.0
	U=1
	I=0
	GAMMA=CPS(T1,J,I)
	P0=0MEG(T1,J,!)
	IQF=1
	AM(1)=28.016
	AM(2)=44,Q11
	AM(3)=32.0
	AM(4)=39.944
	AM(5)=20.183
	AM(6)=2,016 AM(7)=4,003
	AM(8)=18.016
	AM(9)=28.011
	AM(10)=64,066
	SIGMA(1)=3,681
	SIGMA(2)=3.952
	SIGMA(3)=3.499
	SIGMA(4)=3,421
	SIGMA(5)=2,858
	SIGMA(6)=2.915
	SIGMA(7)=2.576
	SIGMA(8)=2.99
	SIGMA(9)=3.678
	SIGMA(10)=4.290
	RAT(1)=91.5
·	RAT(2)=200.0
	RAT(3)=100.0
	RAT(4)=119,5
	RAT(5)=27.5

III 11

```
XMOLW=XMO
      WRITE (6,1)NA, ME, INF, GOODFL
   1 FORMAT (1H1,45x,20HMODEL ATMOSPHERE FOR,1x,24,22x,244,7/)
   WRITE (6,5)DA, TE
5 FORMAT (2X,23HCONSTRUCTION PARAMETERS, 27X, 16HSCIENTIFIC UNITS, 35X,.
     1,5HDATE , 45, 43//)
      WRITE (6,22)PD.TO.RHO.ZTEST.XMO.GO
  22 FORMAT (2X,19HSURFACE PRESSURE = ,F9,2,3H MB,10X,22HSURFACE TEMPER 1ATURE = ,F7.2,2H K, 8X,18HSURFACE DENSITY = ,1PE9,2,6H GM/CC,/,22X,20HBASE OF EXOSPHERE = ,0PF8,2,4H(KM),9X,19HMOLECULAR WEIGHT = 3,5X,0PF6.3,5X,18HSURFACE GRAVITY = ,0PF8.3,11H CM/SEC/SEC)
 WRITE (6,556) NA, ME, RAD, (VOLPER(I), I=1,10)
556 FORMAT (2X,9HRADIUS OF ,1X,2A4,2H= ,F8,2,4H(KM),9X,18HPERCENT NITR
    iogen = ,5x,2PF7.3,11x,16HPERCENT CO2 = ,2PF7,3,/,2x,22HPERCENT O
2XYGEN = ,2PF7,3,12x,23HPERCENT ARGON = ,2PF7,3,11x,
                                                                   = ,2PF7,3,
    316HPERCENT NEON = 2PF7.3,/.2X,22HPERCENT HYDROGEN
                                          ,2PF7,3,11X,16HPERCENT WATER = ,
     412X,23HPERCENT HELIUM
     52PF7,3,/,2X,22HPERCENT CO
                                          = ,2PF7,3,12X,23HPERCENT SO2
                 ,2PF7,3,7//,10X,46HTEMPERATURE AND MOLECULAR WEIGHT DISTR
     6
     7IBUTION:/)
      DO 51 I=2.L
      READ (5,976) IPO, RGM, Z(1), XM(1), TM(1)
 976 FORMAT (11, A1, 7X, 3(F10, 2, 10X))
      IF (XM(1)) 2001,2000,2001
2000 XM(1)=XM0
2001 ET(I)=TM(I)+1.8
      WRITE (6,8) Z(1), RGM, TM(1), XM(1)
   8 FORMAT (10X,2HAT,1X,F10,2,3X,3HGEO,A1,1X,2HKM,8X, 12HTEMPERAT

1URE=,2X,F10,2,2H K,7X,13HAND MOLECULAR,2X,7HWEIGHT=,F10,5)

F7(1)=7(1)+0,003281
      EZ(1)=Z(1)+0.003281
      IF (IPO) 630,631,630
 631 H(I) = RAD + Z(I) / (RAD + Z(I))
      GO TO 782
 630 H(I)=Z(I)
     Z(1) = RAD + Z(1) / (RAD - Z(1))
 782 T(I)=TM(I)
  51 TM(1) = TM(1) + XM0 / XM(1)
     XH1=-RAD/(RAD+1.0)
      TMQ1=(T(2)-T(1))/(H(2)-H(1))*XH1 +T(1)
     DO 633 [ = 2, L
DTDH = (TM(1)=TM(1-1))/(H(1)-H(1-1))
      IF (DTDH)601, 602, 601
 601 P(I) = P(I-1)*(TM(I-1)/TM(I))**( G0*XM0*1.0E*05/(R0*DTDH))
 602 P(I) # P(I-1)*EXP(-GO* XMO*1.0E+05/(RO*TM(I))*(H(I)-H(I-1)))
 633 CONTINUE
      WRITE (6,68)
  68 FORMAT (/ ,1X,21HCALCULATED QUANTITIES,/ )
     WRITE (6,69)
  69 FORMAT (74X,4HMEAN,19X,4HMEAN,/,1X,122HHEIGHT TEMP
LENSITY SPEED FOLECULAR DENS NUMBER FREE
                                                                      PRESSURE
                                                             TEMP
                                                                         VIS-
                                                                                PRE
                                                                               SCAL
                                 UMNAR 7,36X,86HOF SOUND COSITY SCALE VELOCITY FREQ
    2S PARTICLE COLL
                              COLUMNAR
                                                                     WEIGHT
    3E DENSITY
                                                                        MASS
                      PATH
                                                 (GM/CC) (M/SEC)
                          (K)
                                   (MB)
    4,/,IX,122H (KM)
                                    (E+5) (KM) (M/SEC) (PER SEC)
                           (M)
    5KM)
             (PER CC)
     AMASS=0.0
     K=1
```

```
NN = NN + 1
     IENDG=KFLOP/IFLIP+(KSLOP-KFLOP)/IFLOP+((NN-1)-KSLOP)/ISLOP
   12 DO 10 N=1 NN
     M=IABS(N-1)
     ZZ = N - 1
     GB = GO * (RAD / (RAD + ZZ))**2
     IF (IWORLD) 731,730,731
  730 CALL_DET(ZZ,PB,T1,TMQ,XMO,DTDZ)
     GO TO 732
  731 CALL BET(ZZ,PB,T1,TMQ,XMO,DTDZ)
  732 HPRES=R0*T1/(XM0*GB)*+00001
     IF(ZZ-ZTEST) 701,701,702
  702 IF (BASS) 311,312,311
  312 RHBASE=RHO
  311 BASS=1.0
     ZTER=ZTEST+RAD
     ZR=ZZ+RAD
     XERR=SQRT(ZTER **2/(HPRES*ZR))
     IF (XERR-3.0) 304,306,306
  304 SUM=XERR
     TERM=XERR
     DO 301 LL= 1,100
     TERM=TERM*(-XERR**2)*(2.0*XL-1.0)/(XL*(2.0*XL+1.0))
  301 SUM=SUM+TERM
     GO TO 307
  306 SUM=SQRT(PHI)/2.0
  307 ERFX=1.0-2.0/(SQRT(PHI))*SUM
      YERR=SQRT(ZTER **2*ZR/((HPRES*ZR)*(7Z+ZTER )))
      IF (YERR-3.0) 308,310,310
  308 SUMB=YERR
     TERMB=YERR
     DO 305 KK= 1,100
     XK=KK
      TERMB=TERMB*(-YERR**2)*(2.0*XK-1.0)/(XK*(2.0*XK+1.0))
305 SUMB=SUMB+TERMB
      GO TO 309
  310 SUMB=SQRT(PHI)/2.0
309 ERFY=1.0-2.0/(SQRT(PHI))*SUMB
     RHO=RHBASE*(EXP((=ZTER /HPRES)*(1.0-ZTER /ZP))*(1.0-0.5*ERFX)= S
     IGRT(1.0-ZTER **2/ZR**2)*EXP((-ZTER /HPRES)*(ZR/(ZR+ZTER )))*(1.0-0
     2,5*ERFY)-(XERR/SQRT(PHI))*(1,0-SQRT(1,0-ZTER /ZR))*EXP(-ZTER /APRE
     35))
     PB=RH0+T1+R0/(XM0+1000+0)
 701 CONTINUE
     RHO=PB*XM0*1000.0/(R0*T1)
      OMEGA=RHO+GB
     HRHO=HPRES/(1.0+R0/(XMOLW*GB)*DTDZ*.00001)
      XNUMDN=XN*PB*1000,0/(RO*T1)
      VBAR=+01+(8+0+R0+T1/(PHI+XM0))+++5
      XBAR=R0*T1/(1.414*PHI*XN*PB*1000.0*(SIGMA1**2))
      ZONK=XBAR*.01
      CCPP=0.0
      CCVV=0.0
      DO 2100 I.GV=1.10
      CCPP=CCPP+CPS(T1, IQV, IQF) * VOLPER(IQV)
 2100 CCVV=CCVV+(CPS(T1, TQV, TQF)-1,9862)*VOLPER(1QV)
      GAMMA=CCPP/CCVV
```

```
SPEED=0.01+(GAMMA*RO*T1/XM0)++0.5
    XNU=VBAR*100.0/XBAR
    XMU=0.0
    DO 1001 III=1,10
IF (VOLPER(III)) 1005,1001,1005
1005 SUMB1=0.0
    DO 1002 JJJ=1:10
    IF (VOLPER(JJJ)) 1191,1002,1191
1191 IF (III-JJJ) 1003,1002,1003
4003 PHIIJ=(1.0+SQRT(VI(T1,III,IQF)/VI(T1,JJJ,IQF))*(AM(JJJ)/ AM(III))*
   1*(1,0/4,0))**2/(2,82842712*SQRT(1,0+AM(III)/AM(JJJ)))
    SUMB1=SUMB1+PHIIJ*VOLPER(JJJ)/VOLPER(III)
1002 CONTINUE
    XMU=XMU+VI(T1,III,IQF)/(1.0+SUMB1)
1001 CONTINUE
    XKIN=10.0*XMU/RHO*.00001
    AMASS=AMASS+(10.0**5)*(RH0*XRH0)**(.5)
    ์ XRHัก=ห้หัก
    IF (ZZ-ZSLOP) 116,116,118
118 NOV=M/ISLOP
    ZZQV=NQV
    IF (ZZ/SLOP-ZZQV) 16,16,15
116 IF (ZZ-ZFLOP) 27,27,20
 20 NM=M/IFLOP
    ZZM=NM
    IF (ZZ/FLOP-ZZM) 16,16,15
 27 IF (ZZ-ZFLIP) 16,16,18
 18 NK=M/IFLIP
    ZZP=NK
    IF (ZZ/FLIP-ZZP) 16,16,15
 16 WRITE (6,31) M,T1,PB,RHO,SPEED,XMO,HRHO,XNUMDN,ZONK,XMU,HPRES,VBAR
   I, XNU, AMASS
 31 FORMAT (1X,14,F9,1,1P2E10,2,0PF8,0,1X, 0PF8,1,0PF9,2,1P2E10,2,0PF8
   1.2, OPF7, 2, OPF6, 0, 1PE10, 2, 1PE11, 3)
   ET1(K)=T1+1.8
    EPB(K)=PB*14,7/1013.0
 ERHO(K)=RHO+1,943
   ESPEED(K)=SPEED*3.281
   EHPRES(K)=HPRES+0,003281
    EHRHO(K)=HRHO*0.003281
    ENUMDN(K)=XNUMDN+28320.0
    EVBAR(K)=VBAR+3.281
    EXMU(K)=XMU+0,67195+3:108
    EXKIN(K)=XKIN+0.0010764
    EZZ(K)=ZZ*0.003281
    EXBAR(K)=XBAR+0.03281
    EOMEGA(K)=ERHO(1)*GB/30.48
    K=K+1
 15 CONTINUE
 10 CONTINUE
    CMASS AMASS
    CARBON=VOLPER(2)*CMASS*44.011/(XMOLW)
    WRITE (6,50) CMASS, CARBON
 50 FORMAT (/ ,10X,16HCOLUMNAR MASS = ,F8,3,2X,5HGM/CC,20X,23HCOLUMNAR
   1 MASS FOR CO2 = ,F8.3,2X,5HGM/CC)
ERAD=RAD+0.621
    ECMASS=CMASS+0.06375
```

```
WRITE (6,1)NA, ME, INF, QOOOFL
    WRITE (6,64)DA,TE
 64 FORMAT (2X, 23HCONSTRUCTION PARAMETERS, 26X, 17HENGINEERING UNITS, 35X
 1,5HDATE , A5, A3, (//)
    WRITE (6,67) EPO, ETO, ERHN, VOLPER(2), XMOLW, EGO
 67 FORMAT (2X,19HSURFACE PRESSURE = ,F8,3,9H LB/SQ IN,5X,22HSURFACE T
   ÎEMPERATURE = ,F5,1,2H R,5X,18HSURFACE DENSITY = ,1PE9,2,11H SLUG/C
   2U FT.//,2X,26HPER CENT CARBON DIOXIDE = ,2PF5,1,10X,19HMOLECULAR W
   BEIGHT = .OPF5,2,13X,18HSURFACE GRAVITY = .OPF6,2,11H FT/SEC/SEC.//
   4//)
    WRITE (6,68)
    WRITE (6,62)
 62 FORMAT (86X,4HMEAN,7X,4HMEAN,/,2X,120HHEIGHT
                                                     TEMP
                                                             PRESSURE
                         SPECIFIC PRES DENS
     DENSITY
                SPEED
                                                    NUMBER
                                                             PARTICLE
   2 FREE
                       KINETIC, /, 33X, 87H(SLUG/
                                                  OF SOUND
                                                             WEIGHT
              VIS-
           SCALE DENSITY VELOCITY
                                      PATH
                                                        VISC:/,2X,48H
   3CALE_
                                                COSITY
   4(MIL.FT)
                                     CU FT) (FT/SEC), 14X, 47H(MIL, FT)
             (R)
                     (LB/SQ IN)
   5 (PER CU FT) (FT/SEC) (FT)
                                     (E+5)1//)
    DO 115 N=1, IENDG
    WRITE (6,65)EZZ(N), ET1(N), EPB(N), ERHO(N), ESPEED(N),
                                                            EOMEGA(N),E
   ÎHPRES(N), EHRHO(N), ENUMDN(N), EVBAR(N), EXBAR(N), EXMÛ(N), EXKÎNÎN)
    ERHO(N)=ERHO(N)*10.0**15
115 CONTINUE
 65 FORMAT (2X,F7,4,F8,1,1PE11,2,1PE11,2,0PF9.0,1PE11,1,0PF8,3,0PF7,3,
   11PE11,1,0PF7,0,1PE10,1,0PF9,2,1PE11,1)
    WRITE (6,60)ECMASS, ERAD
60 FORMAT (7///,10%,16HCOLUMNAR MASS = ,F6,3,11H SLUG/SQ FT,10%,
   119HPLANETARY PADILS = ,F7.1,6H MILES)
    GO TO 25
   END
```

-	SUBROUTINE BET(Z,PQ,TQ,TMQ,XMQ,DTDZ)
	DIMENSION H(90), TP(90), XM(90), P(90), T(90), VIS(10), RAT(10), AM(10)
	COMMON H.TM.XM.P.GO.RAD.L.RO.XMOLW.T.TMG1.XH1,XMG1,P1,VIS,RAT.AM
	COMMON H, TM, XM, P, GU; KAD, L, RU; AMOLW; T, THE T,
	XH=Z+RAD/(RAD+Z)
	DO 1 1=2.L
	IF (H(I)-XH) 1,2,3
	CONTINUE
3	I=I-1
	IF (H(1)-XH) 4,45,4
45	PQ=P(1)
	TQ=T(1)
	XMQ=XM(1)
	TMG=TG+XMOLW/XMG
	GO TO 9
2	TQ=T(1)
	XMG=XM(I)
	TMQ=TQ+XMOLW/XMQ
	GO TO 25
4	DTDH=(T([+1)= T([))/(H([+1)-H([))
	TG=T(1)+DTDH+(XH-H(1))
	DMDH=(XM(I+1) +XM(I))/(H(I+1)+H(I))
	XMG=XM(I)+DMDH+(XH-H(I))
	TMQ=TQ*XMOLW/XMQ
25	DTDH=(TMQ-TMQ1)/(XH-XH1)
4,5	IF (DTDH) 5.6.5
5	PG=P1 *(TMG1 /TMG)**(GO*XMOLW*1, OE+05/(RO*DTDH))
_	50 70 9
6	PG=P1 *EXP(-G0*XMOLW*1.0E+05/(R0*TMQ)*(XH-XH1))
	T1=TMG1*XMG1/XMOLW
	DTDZ=TMQ-TMG1
	XH1=XH
	TMQ1=TMQ
	XMQ1=XMQ
	P1=PQ
	RETURN
	END
	

FUNCTION OMEG (XT.J.19F)	016/46V5 4776V GP46VX
DIMENSION H(90), TM(90), XM(90), P(90), T(90), (90), T(90), T(90), TM(90), XM(90), P(90), TM(90), TM(9	1412(10)'KV1(10)'W(10)'G
COMMON H, TM, XM, P, GO, RAD, L, RO, XMOLW, T, TMG1;	XH1.XMQ1.P1.VIS.RAT.AM
IF (IGF) 3.8.9	ring promady ary porting ty git
8 CONTINUE	v -, · · · · · · · · · · · · · · · · ·
QT(1)=100.0	
QT(2)=200.0	
QT(3)=300.0	
QT(4)=400.0	
QT(5)=500:0 QT(6)=600:0	
QT(7)=700.0	
C OM(,1) IS NITROGEN (MOLECULAR I.E. N2).	ernam i kant fil et for der flamer i et kommune andere der aus kommen. Er i unger under er men
OM(1,1)=13.36	
OM(2,1)=11.47	
OM(3,1)=9.60	
OM(4,1)=9,43 OM(5,1)=9,137	
OM(6,1)=8,68	The second secon
OM(7,1)=8,509	
C OM(,2) IS CARBON DIOXIDE	
OM(1,2)=23,604	
OM(2,2)=15,708	
OM(3,2)=13.26	ا الله المناب بينسية الله الله الله الله الله الله الله الل
OM(4,2)=11.62	
0M(5,2)=10.73	
OM(6,2)=10.28 OM(7,2)=9,83	
C OM(,3) IS OXYGEN (MOLECULAR I.E. 02)	
OM(1,3)=16,12	
OM(2,3)=11.7	to the second of
OM(3,3)=10.22	a constant of the second of th
OM(4,3)=9,45	
OM(5,3)=9,10	anne aggir e anne e espe e se me an aggir anno an e e e e e e e e e e e e e e e e e e
OM(6,3)=8,81 OM(7,3)=8,59	
C OM(,4) IS ARGON	
OM(1.4)=17.15	
OM(2,4)=12,58	
OM(3,4)=10.75	
OM(4,4)=10.00	
OM(5,4)=9,65	
OM(6,4)=9,49 OM(7,4)=8,86	
C OM(,5) IS NEON	and the same of th
OM(1.5)=9.72	
OM(2,5)=8,65	white the formation is the fibre should administration of a distribution of the distribution of the should be should
OM(3,5)=8,239	
OM(4,5)=7.903	
OM(5,5)=7,470	
OM(6,5)=7.422	
OM(7,5)=7,203 C OM(,6) IS HYDROGEN (MOLECULAR 1.E. H2)	
OM(1,6)=11.04	
OM(2,6)=9,28	
OM(3,6)=8,53	

	FUNCTION CPS (T1, ,, IQF)
	DIMENSION H(90), TM(90), XM(90), P(90), T(90), VIS(10), RAT(10), AM(10), Q
Í	T(7),CP(7,10)
	COMMON H, TM, XM, P, GO, RAD, L, RO, XMOLW, T, TMG1, XH1, XMQ1, P1, VIS, RAT, AM
	IF (IQF) 9,8,9
8	CONTINUE
	QT(1)=100.0
	QT(2)=200.0
	QT(3)=300.0
	QT(4)=400.0
	QT(5)=500+0
	QT(6)=600.0
	QT(7)=700.0
	.1) =NITROGEN
	CP(1,1) =6.9562
	CP(2,1) =6.9571
	CP(3,1) = 6.9613
	CP(4,1) =6.9910
	CP(5,1) =7,0703
	CP(6,1) =7.1968
	CP(7,1) =7.3509
C CP(,2) = CARBON DIOXIDE
•	CP(1,2) =6.9806
	ČP(2,2) =7,7331
	CP(3,2) =8.8942
	CP(4,2) =9.8762
	CP(5,2) =10.6646
	CP(6,2)=11.3098
	CP(7,2) =11.8456
	,3) = MOLECULAR OXYGEN
.	$CP(\hat{1},3) = 6.9567$
	CP(2,3) =6.9615
	CP(3,3) =7,0237
	CP(4,3) =7,1961
	CP(5.3) =7.4315
	CP(6,3) =7.6704
	CP(7,3) =7,8837
C CP(A = ARGON
	CP(1,4) =4.9681
	CP(2,4) =4,9681
	CP(3,4) =4.9681
	CP(4,4) = 4.9681
	CP(5,4) =4,9681
	CP(6,4) = 4,9681
	CP(7,4) =4,9681
	,5) = NEON
	CP(1,5) = 4.9681
	CP(2,5) = 4.9681
	CP(3.5) = 4.9681
	CP(4,5) = 4.9681
	CP(5,5) = (4,9681
	CP(6,5) = 4.9681
	CP(7,5) = 4,9681

```
C CP( ,6) = HYDROGEN
     CP(1,6)=5,3934
     CP(2,6)=6,5182
     CP(3,6)=6,8938
     CP(4,6)=6,9753
     CP(5,6)=6.9932
     CP(6,6)=7,0091
     CP(7,6)=7,0369
C CP(77) = HFLIUM
     CP(1.7) = 4.9681
     CP(2.7) = 4.9681
     CP(3,7) =4.9681
     CP(4,7) = 4.9681
     CP(5,7) =4.9681
     CP(6,7) =4.9681
     CP(7,7) =4.9681
C CP( .8) = WATER
     CP(1,8)=7.9606

CP(2,8)=7.9694
     CP(3,8)=8.0276
     CP(4,8)=8,1864
     CP(5,8)=8.4161
     CP(6,8)=8,6779
     CP(7,8)=8,9571
C CP( 19) = CARBON MONOXIDE
     CP(1,9)=6,9564
CP(2,9)=6,9574
   CP(3,9)=6,9656
     CP(4,9)=7,0129
     CP(5,9)=7,1211
     CP(6,9)=7,2760
     CP(7,9)=7,4507
C CP( 10) # SULFUR DIOXIDE
     CP(1,10)=8,0134
     CP(2,10)=8.6948
     CP(3,10)=9,5451
     CP(4,10)=10,3919
     CP(5,10)=11,1292
     CP(6,10)=11,7189
     CP(7,10)=12,1755
     DO 1 1=1,7
     IF (QT(I)-T1) 1,2,3
    1 CONTINUE
     GO TO 2
    3 I=I-1
     CPS = (CP(I+1,J)-CP(I,J))/(QT(I+1)+QT(I))+(T1+QT(I))+CP(I,J)
     GO TO 4
    2 CPS=CP(I,J)
     RETURN
     END
```

TABLE I. - THE LEGEND FOR THE MODEL ATMOSPHERES

Computer printout		Un	its
heading	Parameter	Scientific	Engineering
Height	Geometric height	km	$\rm ft \times 10^6$
Temp	Temperature	°K	°R
Pressure	Pressure	mb	$lb in.^{-2}$
Density	Density	gcm ⁻³	$\mathrm{slug}\;\mathrm{ft}^{-3}$
Speed of sound	Speed of sound	m sec ⁻¹	ft sec ⁻¹
Molecular weight	Molecular weight	g(g mole) ⁻¹	g(g mole) ⁻¹
Dens scale	Density scale height	km	$ft \times 10^6$
Number density	Number density	cm^{-3}	ft-3
Mean free path	Mean free path	m	ft
Viscosity	Coefficient of viscosity	$kg-m^{-1}sec^{-1} \times 10^5$	$\rm slug~ft^{-1}sec^{-1}\times 10^5$
Pres scale	Pressure scale height	km	$\rm ft \times 10^6$
Mean particle velocity	Mean particle velocity	$m-sec^{-1}$	ft sec ⁻¹
Coll freq	Collision frequency	sec^{-1}	-
Columnar mass	Columnar mass	g-cm ⁻²	_
Kinetic viscosity	Kinematic viscosity	-	${ m ft}^2{ m sec}^{-1}$
Specific weight	Specific weight	<u>-</u>	slug ft ⁻² sec ⁻²

TABLE II. - TYPICAL CONSTRUCTION PARAMETERS FOR A MARS MODEL ATMOSPHERE

	face Boundary	ì				
Parameter		!	nbol	Value		
Mean acceleration caused at the surface	by gravity	g _o , cm s	ec^{-2}	375.0		
Planetary radius		r, km	3381.0			
Atmospheric temperature the surface	near	T, °K	210.0			
Mean molecular mass		m, g(g r	44. 011			
Atmospheric pressure nea	ar	P, mb	5.0			
CO ₂ , volume percent		x ₂ × 100		100.0		
Temperature	e and Molecula	ar Weight Di	stribution			
Z, km	Т,	°K		m		
14	140)		44. 011 44. 011 41. 05 35. 265		
70	104	1. 19				
90	91	. 39				
100	85	5. 0	! ·			
110	85	5.0	;	29.48		
150	. 85	5.0		16.84		
200	85	5. 0		16.0		
1000		5. 0		16.0		

TABLE III. - MODEL ATMOSPHERE FOR MARS

					PODEL ATM	CSPHFRF	FOR MARS			-	LOWER		
CONSTR	UCT10N	PARAMETERS			sε	IENT IF IC	UNITS				DATE 9/20/	67	
SUBFAC	E PRESS	UDF =	5.00 NB		DEACE TEN	OCDATION.	= 210.00	· · · · · · · · · · · · · · · · · · ·					
BASE O	F EXOSP	HERE = 40			LECULAR WE		44.01		SUPPACE ACE GRA			•26-05 GM/ • CM/SEC/SI	
	OF MAR		81.00(KM)		RCENT NITE		•00	0	PEPCE	NT COP	= 100	.000	
	T HYDRO		•000		RCENT ARGO		•00•			NT MEON		•000	
PERCEN		=	•000		RCENT 502	=	•00		FLFCI	MT." wwTr	R_=	`••000° —	
	TEMPE	RATURE AND	MOLECULAR	WEIGHT DI	STRIBUTIO	٧,							
	AT_	14.00	GEOM KM		FRATURE=		•00 K	AND MOLE					
	AT AT	70 • 00 90 • 00	GEON KM		EPATURE=		•19 F •39 K	AND MOLE		WF IGHT=			
	AT	100.00	GE ON KY		FRATURF=		• CO K	AND MOLE		WFIGHT=			
	AT	110.00	GEOM KM		FRATURF=	65	•00 K	AND MOLE	CHLAP	WEIGHT:	29.48	090	
	AT AT	150.00 200.00	GEOM KM GEOM KM		FRATURF=		•00 K	AND MOLE					
	AT	1000-00	GEOP KM		FRATURE=		*00 K	AND MOLE			16.00		
CALCULA	TED QUA	INTITIES		7277									
CALCULA	TED QUA		DENSITY	SPFED	MOLECULAR	DENS	NUMPER	MFAN FPFE	VIS-	PPES	MEAN PARTICL	F COLL	COLUMNAR
		INTITIES						MFAN	VIS-	PPES SCALF	MEAN PARTICL VELOCIT	F COLL	COLUMNAR MASS
HEIGHT (KM)	TEMP (K) 210.0	PRESSURE (MG) 5.00+00	DENSITY (GM/CC) 1.26-05	SPEED OF SOUNC (M/SEC)	MOLECUILAR NEIGHT	DENS SCALF (KM)	FUMPER PENSITY (PEP CC) 1.72+17	MFAN FPFE PATH (M)	VIS- COSITY (F+5)	PPES SCALF (KM)	MEAN PARTICL VELOCIT (M/SFC)	F COLL Y FREO (PFR SFC) 3.90+07	MASS 0.000
HEIGHT (KM) 0 5	TEMP (K) 210.0 184.9	PRESSURE (MG) 5.00+00 3.02+00	DENSITY (GM/CC) 1.26-05 8.66-06	SPEED OF SOUNC (M/SEC) 230. 217.	MOLECULAR NEIGHT	DENS SCALF (KM) 14-16 12-51	NUMPER PENSITY (PEP CC) 1.72+17 1.18+17	MFAN FPFE PATH (N) 8-36-06 1-22-05	VIS-	PPES SCALF (KM) 10.58	MEAN PARTICL VELOCIT (M/SFC) 318.	F COLL Y FREO (PFR SFC) 3.40+07 2.45+07	MASS 0.000 5.272+00
HEIGHT (KM)	TEMP (K) 210.0	PRESSURE (MG) 5.00+00	DENSITY (GM/CC) 1.26-05	SPEED OF SOUNC (M/SEC)	MOLECUILAR NEIGHT	DENS SCALF (KM)	PUMPER PENSITY (PEP CC) 1.72+17 1.18+17 7.72+16	MFAN FPEE PATH (N) 9-36-06 1-22-05 1-27-05	VIS- COSITY (F+5) 1.06 .91 .76	PPES SCALF (KM) 10.5A 0.34	MEAN PARTICL VELOCIT (M/SFC) 318. 298. 277.	F COLL Y FREO (PFR SFC) 3.80+07 2.45+07 1.49+07	MASS 0.000 5.272+00 8.809+00
HEIGHT (KM) 0 5 10 15 20	TEMP (K) 210.0 184.9 159.9 139.4	PRESSURE (Mh) 5.00+00 3.02+00 1.70+00 6.74+01 4.28+01	0ENSITY (6M/CC) 1.26-05 6.66-06 5.64-06 3.32-06 1.67-06	SPEED OF SOUNC (M7SEC) 230. 217. 203. 140.	MOLECULAR VEIGHT 44.0 44.0 44.0 44.0	DENS SCALF (KM) 14-16 12-51 10-85 7-32 7-18	PUMPER PENSITY (PEP CC) 1.72+17 1.10+17 7.72+16 4.54+16 2.28+16	MFAN FPEE PATH (N) 9-36-06 1-22-05 1-77-05 3-17-05 6-32-05	VIS-	PPES SCALF (KM) 10.5A 9.34 9.11 7.04 6.94	MEAN PARTICL VELOCIT (M/SFC) 318.	F COLL Y FREO (PFR SFC) 3.40+07 2.45+07	MASS 0.000 5.272+00
HEIGHT (KM) 0 5 10 15 20 25	TEMP (K) 210.0 184.9 159.9 139.4 136.1 132.9	PRESSURE (Mis) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 2.07-01	DENSITY (6M/CC) 1.26-05 6.66-06 5.64-06 3.32-06 1.67-06 6.24-07	SPEED OF SOUNC (M7SEC) 230. 217. 203. 140. 188.	MOLECULAR VEIGHT 44.0 44.0 44.0 44.0 44.0 44.0	DENS SCALF (KM) 14-16 12-51 10-85 7-18 7-18 7-03	PUMPER PENSITY (PEP CC) 1-72+17 1-16+17 7-72+16 4-54+16 2-28+16 1-13+16	MFAN FPEE PATH (N) P-56-06 1-22-05 3-17-05 6-32-05 1-28-04	VIS- COSITY (F+5) 1.06 .91 .76 .64 .64	PPES SCALF (KM) 10.5A 9.34 9.11 7.04 6.94 6.79	MEAN PARTICL VELOCIT (N/SFC) 318. 298. 277. 256. 256.	F COLL Y FREO (PFR SFC) 3-AN+07 1-49+07 4-16+06 4-05+06	MASS 0.000 5.272+00 8.809+00 1.104+01 1.224+01 1.283+01
HEIGHT (KM) 0 5 10 15 20	TEMP (K) 210.0 184.9 159.9 139.4	PRESSURE (Mh) 5.00+00 3.02+00 1.70+00 6.74+01 4.28+01	DENSITY (6M/CC) 1.26-05 6.66-06 5.64-06 3.32-06 1.67-06 6.24-07 4.01-07	SPEED OF SOUNC (M7SEC) 230. 217. 203. 140. 148. 146.	MOLECULAR NEIGHT 44.0 44.0 44.0 44.0 44.0 44.0 44.0	DENS SCALF (KM) 14-16 12-51 10-85 7-32 7-18 7-03 6-87	PUMPER PENSITY (PEP CC) 1.72+17 1.18+17 4.54+16 2.28+16 1.13+16 5.49+15	MFAN FPEE PATH (M) P-*6-06 1-22-05 1-87-05 1-28-04 2-63-04	VIS- COSITY (F+5) 1.06 .91 .76 .65 .64	PPES \$CALF (KM) 10.5a 0.34 0.11 7.0a 6.94 6.79 6.65	MEAN PARTICL VELOCIT (M/SFC) 318. 277. 250. 256. 257. 250.	F COLL Y FREO (PFR SFC) 3-AN+07 2-48+07 1.48+07 4-05+06 4-05+06 1-98+06 9-51+05	MASS 0.000 5.272+00 8.809+00 1.104+01 1.224+01 1.283+01 1.313+01
HEIGHT (KM) 0 5 10 15 20 25 30 35 40	TEMP (K) 210.0 184.9 159.9 136.1 132.9 129.6 120.4 123.2	PRESSURE (Mi) 5.00+00 3.02+00 1.70+00 8.74+01 4.28-01 9.83-02 4.59-02 2.11-02	0ENSITY (6M/CC) 1.26-05 6.66-06 5.64-06 3.32-06 1.67-06 6.24-07 4.01-07 1.92-07	SPEED OF SOUNC (M7SEC) 230. 217. 203. 140. 188.	MOLE CUILAR %E I GHT 44 • 0 44 • 0	DENS SCALF (KM) 14-16 12-51 10-85 7-18 7-18 7-03	PUMPER PENSITY (PEP CC) 1-72+17 1-16+17 7-72+16 4-54+16 2-28+16 1-13+16	MFAN FPEE PATH (N) P-56-06 1-22-05 3-17-05 6-32-05 1-28-04	VIS- COSITY (F+5) 1.06 .91 .76 .64 .64	PPES SCALF (KM) 10.5A 9.34 9.11 7.04 6.94 6.79	MEAN PARTICL VELOCIT (N/SFC) 318. 298. 277. 256. 256.	F COLL Y FREO (PFR SFC) 3-AN+07 1-49+07 4-16+06 4-05+06	MASS 0.000 5.272+00 8.809+00 1.104+01 1.224+01 1.283+01 1.313+01 1.327+01
HEIGHT (KM) 0 5 10 15 20 25 30 35 40 45	1EMP (K) 210.0 184.9 159.9 139.4 136.1 132.9 129.6 126.4 123.2 120.0	PRESSURE (Mi) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 2.07-01 9.83-02 4.59-02 2.11-02 9.52-03	1.26-05 6.66-06 5.64-06 3.32-06 6.24-07 4.01-07 1.92-07 0.06-08 4.20-08	SPEED OF SOUNC (M/SEC) 230. 217. 203. 190. 198. 196. 117. 150.	MOLECULAR WEIGHT 44.0 44.0 44.0 44.0 44.0 44.0 44.0 44.	DENS SCALF (KM) 14-16 10-85 7-32 7-18 7-03 6-87 6-72 6-57 6-42	PUMPER PENSITY (PEP CC) 1.72+17 1.18+17 7.72+16 4.44+16 2.28+16 1.13+16 2.63+15 1.24+15 1.24+15	MFAN FPEE PATH (N) P-*6-06 1-22-05 1-27-05 1-28-04 2-63-04 5-48-04 1-16-03 2-61-03	VIS- COSITY (F+s) 1.06 .91 .76 .65 .64 .62 .61 .50	PPES \$CALF (KM) 10.5A 9.11 7.04 6.74 6.74 6.65 6.56 6.56	MEAN PARTICL VELOCIT (M/SFC) 318. 277. 257. 256. 257. 247. 240.	F COLL Y.FREO (PFR SFC) 3.AN+07 2.48+07 1.49+07 4.08+06 1.99+06 4.08+06 4.51+08 4.51+08 2.11+05 2.11+05 9.51+04	0.000 5.272+00 8.809+00 1.104+01 1.224+01 1.313+01 1.313+01 1.334+01 1.334+01
HEIGHT (KM) 0 5 10 15 20 25 30 35 40 45 50	7EMP (K) 210.0 184.9 159.9 139.4 136.1 132.9 129.6 120.4 123.2 120.0 116.8	PRESSURE (Mis) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 9.03-02 2.11-02 9.52-03 4.21-03	1.26-05 6.66-06 5.64-06 5.64-06 1.67-06 6.24-07 4.01-07 4.01-07 4.06-08 4.20-02 1.91-09	SPEED OF SOUNC (M/SEC) 230. 217. 203. 190. 188. 196. 184. 162. 177.	MOLECULAR VEIGHT 44.0 44.0 44.0 44.0 44.0 44.0 44.0 44.	DENS SCALF (KM) 14-16 12-51 10-65 7-17 7-03 6-87 6-72 6-57 6-42 6-27	PUMPER PENSITY (PEP CC) 1-72+17 1-118+17 7-72+16 4-44-16 2-28+16 1-13+16 4-415 2-63+15 1-24+15 4-75+14 2-61+14	MFAN FPEE PATH (N) 8-*6-06 1-22-05 3-17-05 6-*2-05 1-28-04 2-63-04 1-16-03 2-51-03 5-12-03	VIS- COSITY (F+s) 1.06 .91 .76 .64 .62 .61 .58	PPES SCALF (KM) 10.5A 9.34 9.11 7.02 6.94 6.70 6.50 6.50 6.36	MEAN PARTICU VELOCIT (M/SFC) 318. 277. 256. 253. 251. 247. 243. 247.	F COLL Y FREO (PFR SFC) 3.80+07 2.44+07 R.16+06 4.05+06 9.51+05 2.10+05 9.58+04 4.50+05 9.58+04 4.70+05	0.000 5.272+00 8.809+01 1.104+01 1.224+01 1.313+01 1.313+01 1.334+01 1.337+01 1.337+01
HEIGHT (KM) 0 5 10 15 20 25 30 35 40 45	1EMP (K) 210.0 184.9 159.9 139.4 136.1 132.9 129.6 126.4 123.2 120.0	PRESSURE (Mi) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 2.07-01 9.83-02 4.59-02 2.11-02 9.52-03	1.26-05 6.66-06 5.64-06 3.32-06 6.24-07 4.01-07 1.92-07 0.06-08 4.20-08	SPEED OF SOUNC (M/SEC) 230. 217. 203. 190. 198. 196. 117. 150.	MOLECULAR WEIGHT 44.0 44.0 44.0 44.0 44.0 44.0 44.0 44.	DENS SCALF (KM) 14-16 10-85 7-32 7-18 7-03 6-87 6-72 6-57 6-42	PUMPER PENSITY (PEP CC) 1.72+17 7.72+16 4.44+16 2.24+16 1.13+16 2.63+15 1.24+15 1.24+15 1.25+14 2.61+14 1.17+14	MFAN FREE PATH (N) P-36-06 1-22-05 1-77-05 3-17-05 6-32-01 1-28-04 1-16-03 2-63-04 5-18-03 1-2-03 1-2-03	VIS- COSITY (F+G) 1.06 .91 .76 .65 .64 .62 .62 .63 .69 .69 .69 .69	PPES SCALF (KM) 10.5A 9.31 7.02 6.94 6.79 6.65 6.56 6.51 6.06	MEAN PARTICL VELOCIT (M/SFC) 318. 277. 257. 257. 257. 257. 247. 247. 247. 247. 234.	F COLL Y FREO (PFR SFC) 3.AN+07 2.48+07 1.48+07 4.16+06 4.05+06 4.51+05 4.51+05 4.51+05 4.51+05 4.51+05 4.51+05 4.51+05 4.51+05 4.51+05 4.51+05 4.51+05 4.51+05 4.51+06 4.51+0	0.000 5.272+00 8.809+00 1.104+01 1.224+01 1.283+01 1.313+01 1.337+01 1.338+01 1.338+01 1.338+01
HEIGHT (KM) 0 5 10 15 20 25 30 35 40 45 50 65	7EMP (K) 210.0 184.9 159.9 139.4 136.1 129.6 120.4 123.2 120.0 116.8 113.7 110.5	PRESSURE (Mi) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 9.03-02 4.59-02 2.11-02 9.52-03 1.23-03 7.77-64	0ENSITY (6M/CC) 1.26-05 6.66-06 5.64-06 5.64-06 1.67-06 6.24-07 4.01-07 4.01-07 4.20-08 4.20-08 4.21-09 8.51-09 3.72-09	SPEED OF SOUNC (M/SEC) 230. 217. 203. 140. 180. 174. 175. 175. 175. 170. 168.	MOLE CUI. AR %E I GHT 44 • 0 44 • 0 4	DENS SCALF (KM) 14.16 12.51 10.65 7.32 7.16 7.03 6.87 6.87 6.87 6.87 6.12 5.96 5.96	PUMPER PENSITY (PEP CC) 1-72+17 1-18+17 7-72+16 4-54+16 2-28+16 2-13+16 5-49+15 2-63+15 1-24+1	MFAN FPEE PATH (W) P. 16-06 1.22-05 1.47-05 3.17-05 6.72-05 1.28-04 1.16-03 2.61-03 1.24-02 2.63-02 6.62-02	VIS- COSITY (F+s) 1.06 .91 .76 .64 .62 .61 .58	PPES SCALF (KM) 10.54 9.11 7.04 6.79 6.65 6.50 6.36 6.91 6.91 6.77	MEAN PARTICLY (M/SFC) 318. 298. 277. 250. 251. 247. 243. 241. 234. 231. 227.	F COLL Y FREO (PFR SFC) 3.80+07 2.44+07 R.16+06 4.05+06 9.51+05 2.10+05 9.58+04 4.50+05 9.58+04 4.70+05	0.000 5.272+00 8.809+01 1.104+01 1.224+01 1.313+01 1.313+01 1.334+01 1.337+01 1.337+01
HEIGHT (KM) 0 5 10 25 35 40 45 55 60 65	TEMP (K) 210.0 184.9 159.9 159.9 139.4 136.1 132.9 129.6 120.4 123.2 120.0 116.8 113.7 110.5 107.3	PRESSURE (Mh) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 2.07-01 9.03-02 2.11-02 2.11-02 2.12-03 1.23-03 1.23-03 1.23-03 1.23-03 1.23-04	1.26-05 6.66-06 5.64-06 3.32-06 6.24-07 4.01-07 1.92-07 4.20-08 1.91-06-08 4.20-08 1.91-06-08 7.72-09 1.59-09 6.65-10	SPEED OF SOUNC (M7SEC) 230. 217. 203. 190. 188. 196. 150. 177. 175. 173. 170. 168. 166.	MOLECULAR VEIGHT 44.0 44.0 44.0 44.0 44.0 44.0 44.0 44.	DENS SCALF (KM) 14.16 10.85 7.32 7.18 7.03 6.87 6.72 6.72 6.87 6.87 6.87 6.87 6.87 6.87 6.87 6.87	PUMPER PENSITY (PEP CC) 1.72+17 1.18+17 7.72+16 4.54+16 2.28+16 2.28+16 5.463+15 1.24+15 1.24+15 1.24+15 1.27+14 2.61+14 2.60+13 2.18+13 2.19+13	MFAN FPEE PATH (W) 8-*6-06 1-22-05 1-77-05 3-17-05 1-28-04 2-6-03 1-16-03 5-5-04 1-16-03 1-24-02 2-6-2-02 1-8-01 1-8-01	VIS- COSTY (F+E) 1.06 .91 .76 .65 .64 .62 .61 .50 .64 .65 .64 .65 .64 .65 .65 .64 .65 .65	PPES CCALF) 10.5a 9.34 7.02 6.94 6.65 6.50 6.65 6.21 6.06 5.91 5.97 5.97	MEAN PARTICL VELOCITY (M/SFC) 298. 277. 256. 257. 257. 247. 247. 247. 231. 227. 224.	F COLL Y. FREO (PFR SFC) 3.80+07 2.48+07 1.49+07 8.16+06 4.08+06 9.51+08 9.51+08 9.51+08 4.50+06 4.50+	0.000 5.272+00 8.809+00 1.104+01 1.224+01 1.313+01 1.334+01 1.337+01 1.338+01 1.339+01 1.339+01 1.339+01
HEIGHT (KM) 0 5 10 15 20 25 30 35 40 45 50 65	7EMP (K) 210.0 184.9 159.9 139.4 136.1 123.9 129.6 120.0 116.8 113.7 110.5 107.3	PRESSURE (Mis) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 9.03-02 2.11-02 9.52-03 1.23-04 1.31-04 5.22-05	1.26-05 6.66-06 5.64-06 5.64-06 1.67-06 6.24-07 4.01-07 4.01-07 4.00-08 4.20-08 4.20-08 1.91-06 8.51-09 3.72-09 3.72-09 6.65-10 2.69-10	SPEED OF SOUNC (M/SEC) 230. 217. 203. 140. 188. 196. 154. 160. 177. 175. 173. 170. 168. 166. 165.	MOLECULAR VEIGHT 44.0 44.0 44.0 44.0 44.0 44.0 44.0 44	DENS SCAL F (KM) 14-16 12-51 10-85 7-18 7-03 6-87 6-87 6-12 5-96 5-91 5-65 5-81	PUMPER PENSITY (PEP CC) 1.72+17 1.18+17 7.72+16 4.54+16 2.28+16 2.13+16 5.43+15 2.63+15 2.63+15 2.61+14 1.17+14 5.00+13 2.18+13 0.19+12 2.19+13	MFAN FPEE PATH (M) 9. %6-06 1.22-05 1.27-05 6. %2-05 1.28-04 2.63-04 1.6-03 2.61-03 1.20-02 2.63-02 1.6-03 1.20-02 1.6-03 1.20-02 1.6-03 1.20-	VIS- COSITY (F+E) 1.06 .91 .76 .65 .64 .50 .50 .50 .50 .50 .50 .50 .50 .50 .50	PPES CCALF (KMS) 10.534 9.11 7.094 6.795 6.795 6.366 6.50 6.50 6.51 6.91 7.62 7.62 7.62 7.62	MEAN PARTICIT (M/SFC) 318. 298. 277. 254. 250. 247. 243. 247. 234. 237. 234. 227. 222.	F COLL Y FREO (PFR SFC) 3.80+07 2.45+07 1.44+07 8.16+06 4.05+06 9.51+05 9.51+05 9.58+04 4.70+01 1.89+04 8.14+03 3.47+03 1.41+03 5.77+02	0.000 5.272+00 8.809+00 1.104+01 1.224+01 1.233+01 1.333+01 1.337+01 1.337+01 1.339+01 1.339+01 1.339+01 1.339+01 1.339+01
HE IGHT (KM) 0 5 10 15 20 25 30 35 40 45 55 60 65 75 80	1EMP (K) 210.0 184.9 159.9 139.4 136.1 132.9 129.6 120.0 116.8 113.7 110.5 107.3 104.2 101.0 97.8	PRESSURE (Min) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 2.07-01 9.83-02 2.11-02 9.52-03 4.21-03 1.83-03 7.77-04 3.23-04 1.31-04 5.22-05 8.02-06	1.26-05 6.66-06 5.64-06 3.32-06 1.67-06 6.24-07 4.01-07 4.01-07 4.06-08 4.20-08 4.20-08 1.91-00-6.51-09 6.65-10 1.08-10 4.26-11	SPEED OF SOUNC (M7SEC) 230. 217. 203. 190. 188. 196. 150. 177. 175. 173. 170. 168. 166.	MOLECULAR VEIGHT 44.0 44.0 44.0 44.0 44.0 44.0 44.0 44.	DENS SCALF (KM) 14.16 10.85 7.32 7.18 7.03 6.87 6.72 6.72 6.87 6.87 6.87 6.87 6.87 6.87 6.87 6.87	PUMPER PENSITY (PEP CC) 1.72+17 1.18+17 7.72+16 4.54+16 2.28+16 2.28+16 5.463+15 1.24+15 1.24+15 1.24+15 1.27+14 2.61+14 2.60+13 2.18+13 2.19+13	MFAN FPEE PATH (W) 8-*6-06 1-22-05 1-77-05 3-17-05 1-28-04 2-6-03 1-16-03 5-5-04 1-16-03 1-24-02 2-6-2-02 1-8-01 1-8-01	VIS- COSTITY (F+c) 1.06 .91 .76 .66 .64 .62 .61 .60 .60 .60 .60 .60 .60 .60 .60 .60 .60	PPES (KM) 10.5a 9.34 9.11 7.09 6.99 6.65 6.50 6.51 6.91 6.91 6.91 6.91 6.91 6.91 6.91 6.9	MEAN PARTICL VELOCITI (M/SFC) 31A. 277. 254. 257. 247. 247. 247. 231. 227. 221. 221.	F COLL Y.FREO (PFR SFC) 3.AN+07 2.43+07 1.49+07 4.16+06 1.49+06 4.51+06 4.51+06 4.51+06 4.51+06 4.51+06 4.51+06 4.51+06 4.51+06 5.14+03 5.77+02 2.33+02	0+000 5+272+00 8+809+00 1+104+01 1+283+01 1+313+01 1+313+01 1+337+01 1+339+01 1+339+01 1+339+01 1+339+01 1+339+01
HE1GHT (KM) 0 5 10 25 30 35 40 45 50 65 70 75 80 85 90	1EMP (K) 210.0 184.9 159.9 139.4 136.1 132.9 129.6 120.0 116.8 113.7 110.5 107.3 104.2 101.0 97.8 94.6	PRESSURE (Mi) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 9.63-02 4.59-02 2.11-02 9.52-03 1.63-03 7.77-04 1.31-04 5.22-05 6.02-06 3.09-06	0ENSITY (6M/CC) 1.26-05 6.66-06 5.64-06 5.64-06 1.67-06 4.24-07 4.01-07 1.92-07 4.01-06 3.72-09 3.72-09 6.65-10 1.08-10 4.26-11 1.08-10	SPEED OF SOUNC (M/SEC) 230. 217. 203. 140. 188. 146. 150. 177. 175. 176. 168. 166. 165. 163. 160.	MOLE CUI. AR %E IGHT 44 • 0 44 • 0 46	DENS SCALF (KM) 14.16 12.51 10.51 7.18 7.18 7.03 6.87 6.57 6.42 6.27 6.12 5.96 5.96 5.44 5.30	PUMPER PENSITY (PEP CC) 1-72+17 1-16+17 7-72+16 4-54+16 2-28+16 2-13+16 5-46+15 2-66+15 1-24+15 5-15+14 1-17+14 5-16+114 1-17+14 5-16+13 0-10+12 2-74+12 1-52+12 6-14+11	MFAN FREE PATH (N) P.**C-06 1.22-05 1.77-05 3.17-05 6.**2-05 1.28-04 5.48-03 2.61-03 5.2-03 1.24-02 2.63-02 1.64-03 2.61-03 5.62-02 1.64-03 2.64-03 1.24-02 2.63-02 1.64-03 2.64-03 1	VIS- COSITY (F+E) 1.06 .91 .76 .65 .64 .50 .50 .50 .50 .50 .50 .50 .50 .50 .50	PPES (KM) 10.5a 9.11 7.03 6.94 6.97 6.65 6.21 6.91 6.79 6.65 6.31 6.91 6.79 6.47	MEAN PARTICU VELOCIT (M/SFC) 31A. 298. 277. 259. 259. 243. 241. 231. 221. 221. 221. 217.	F COLL Y FREO (PFR SFC) 3.80+07 2.45+07 1.44+07 8.16+06 4.05+06 9.51+05 9.51+05 9.58+04 4.70+01 1.89+04 8.14+03 3.47+03 1.41+03 5.77+02	0.000 5.272+00 8.809+00 1.104+01 1.224+01 1.233+01 1.333+01 1.337+01 1.337+01 1.339+01 1.339+01 1.339+01 1.339+01 1.339+01
HEIGHT (KM) 0 5 10 15 20 35 40 45 50 65 67 75 80 95	1EMP (K) 210.0 184.9 159.9 159.9 136.1 132.9 129.6 120.0 116.8 113.7 110.5 107.3 104.2 101.0 97.8 94.6	PRESSURE (Mh) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 2.07-01 9.83-02 2.11-02 2.11-02 2.11-02 3.23-04 1.31-04 5.22-05 8.02-05 3.09-06 1.20-06	0ENSITY (6W/CC) 1.26-05 6.66-06 5.64-06 3.32-06 1.67-06 6.24-07 1.92-07 0.06-08 4.20-08 1.91-06 6.55-10 2.69-10 1.08-10 4.26-11 2.69-10	SPEED OF SOUNC (M7SEC) 230. 217. 203. 190. 198. 196. 154. 172. 175. 175. 175. 176. 168. 166. 165. 163. 160.	MOLECULAR V:EIGHT 44.0 44.0 44.0 44.0 44.0 44.0 44.0 44	DENS SCALF (KW) 14.16 12.51 10.85 7.18 7.03 6.87 6.72 6.72 6.72 6.87 6.87 6.87 6.87 6.87 6.87 6.87 6.87	PUMPER PENSITY (PEP CC) 1.72+17 1.18+17 7.72+16 4.54+16 2.28+16 2.28+16 1.13+16 5.43+15 1.24+15 1.24+15 2.61+14 1.17+14 2.61+14 2.61+14 1.17+14 2.16+13 2.16+1	MFAN FPEE PATH (W) 8.**6-06 1.22-05 1.77-05 3.17-05 6.**2-04 2.63-04 1.16-03 2.61-03 1.24-02 2.63-02 1.58-01 3.98-01 2.48-01 2.48-01 2.48-01	VIS- COSITY (F+E) 1.06 .91 .76 .65 .61 .50 .60 .60 .60 .60 .60 .60 .60 .60 .60 .6	PPES SCALF (KM) 10.5A 9.11 7.04 6.70 6.56 6.50 6.50 6.70 6.50 6.70 6.50 6.70 6.50 6.70	MEAN PARTICL VELOCIT (M/SFC) 318. 298. 277. 259. 251. 247. 241. 231. 221. 221. 221. 221. 221. 221. 22	F COLL Y. FREO (PFR SFC) 3.40+07 2.445+07 1.49+07 4.16+06 4.05+06 9.51+05 2.10+05 9.51+04 4.70+04 4.70+04 4.70+04 7.44+03 7.43+03 7.77+02 9.33+01 7.69+01 1.52+01	0.000 5.272+00 8.809+00 1.104+01 1.224+01 1.313+01 1.334+01 1.337+01 1.339+01 1.339+01 1.339+01 1.339+01 1.339+01 1.339+01 1.339+01 1.339+01 1.339+01 1.339+01 1.339+01
HE1GHT (KM) 0 5 10 25 30 35 40 45 50 65 70 75 80 85 90	1EMP (K) 210.0 184.9 159.9 139.4 136.1 132.9 129.6 120.0 116.8 113.7 110.5 107.3 104.2 101.0 97.8 94.6	PRESSURE (Mi) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 9.63-02 4.59-02 2.11-02 9.52-03 1.63-03 7.77-04 1.31-04 5.22-05 6.02-06 3.09-06	0ENSITY (6M/CC) 1.26-05 6.66-06 5.64-06 5.64-06 1.67-06 4.24-07 4.01-07 1.92-07 4.01-06 3.72-09 3.72-09 6.65-10 1.08-10 4.26-11 1.08-10	SPEED OF SOUNC (M/SEC) 230. 217. 203. 140. 188. 146. 150. 177. 175. 176. 168. 166. 165. 163. 160.	MOLECULAR %EIGHT 44.0 44.0 44.0 44.0 44.0 44.0 44.0 44	DENS SCALF (KM) 14.16 12.51 10.51 7.18 7.18 7.03 6.87 6.57 6.42 6.27 6.12 5.96 5.96 5.44 5.30	PUMPER PENSITY (PEP CC) 1.72+17 1.18+17 7.72+16 4.54+16 2.28+16 2.28+16 1.13+16 5.43+15 2.63+15 2.63+15 2.61+14 1.17+14 5.00+13 2.16+13 0.10+12 2.74+17 0.10+12 1.52+12 6.14+11 2.45+11 2.45+11 2.45+11 2.45+11 2.45+11 2.45+11	MFAN FPEE PATH (M) 8. %6-06 1.22-05 1.27-05 6. %2-05 1.28-04 2.63-04 1.16-03 2.61-03 1.24-02 1.58-01 2.65-01 1.05-01 2.45-01 2.45-01 1.45-01 2.45-01 2.45-01	VIS- COSITY (F+c) 1.06 .91 .76 .61 .62 .63 .63 .64 .62 .64 .64 .64 .64 .64 .64 .64 .64 .64 .64	PPES \$CALF (KM) 10.5a 0.34 0.11 7.00 6.94 6.97 6.65 6.21 6.09 6.50 1.00 5.47 5.47 5.47 5.47 5.47 5.47	MEAN PARTICLE (M/SFC) 318. 298. 277. 259. 250. 247. 243. 247. 234. 227. 221. 221. 221. 221.	F COLL Y FREO (PFR SFC) 3.80+07 2.44+07 1.44+07 6.16+06 4.05+06 9.51+05 9.58+04 4.70+05 9.58+04 1.00+06 9.51+05 9.58+01 1.00+06 9.51+05 9.58+01 1.00+06 9.51+05 9.58+01 1.00+06 9.51+05 9.58+01 1.00+06 9.51+05 9.58+01 1.00+06 9.51+06 1.00+0	0.000 5.272.00 8.809.400 1.104.401 1.224.401 1.313.401 1.334.401 1.334.401 1.334.01 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401
HEIGHT (KM) 0 5 10 15 20 30 35 40 45 55 60 65 77 80 85 90 91 100 1120	1EMP (K) 210.0 184.9 159.9 159.9 129.6 120.0 120.0 120.0 116.8 113.7 110.5 107.3 104.2 101.0 97.8 94.6 91.4 88.2 85.0 85.0	PRESSURE (MG) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 1.2.07-01 9.83-02 2.11-02 9.52-03 1.83-03	0ENSITY (GM/CC) 1.26-05 8.66-06 5.64-06 3.32-06 1.67-06 6.24-07 4.01-07 4.01-07 4.02-08 4.20-08 4.20-08 1.91-06 8.51-09 1.59-09 1.59-09 1.59-09 1.68-10 1.08-10 1.67-11 1.62-12 4.05-13 4.05-13 4.05-13 4.05-13 4.05-13 4.05-13 4.05-13 4.05-13	SPEED OF SOUNC (M/SEC) 230. 217. 203. 190. 196. 196. 159. 175. 173. 170. 168. 166. 163. 160. 163. 166. 192. 193.	MOLECULAR VEIGHT 44.0 44.0 44.0 44.0 44.0 44.0 44.0 44	DENS SCALF (KM) 14.16 12.51 10.82 7.18 7.03 6.87 6.70 6.57 6.12 5.96 5.81 5.81 5.40 5.44 5.30 6.27 6.27	PUMPER PENSITY (PEP CC) 1.72+17 1.18+17 7.72+16 4.54+16 2.28+16 1.13+16 5.49+15 5.49+15 5.49+15 5.49+15 7.17+14 5.40+13 2.18+13 0.11+12 1.72+12 1.52+1	MFAN FPEE PATH (M) 8.46-06 1.22-05 1.27-05 3.17-05 6.2-05 1.28-04 1.6-03 2.61-03 2.61-03 1.24-02 2.63-02 1.58-01 9.05-01 9.05-01 1.05-01 1.05-01 1.05-01 1.05-01 1.05-01 1.05-01 1.05-01 1.05-01 1.05-01 1.05-01 1.05-01	VIS- COSITY (F+E) 1.06 .91 .76 .65 .61 .50 .60 .60 .60 .60 .60 .60 .60 .60 .60 .6	PPES CCALF (KM) 10.5a 0.34 0.11 7.0a 6.94 6.65 6.50 6.59 1.59 1.59 1.59 1.59 1.59 1.59 1.59 1	MEAN PARTICLE (M/SFC) **18. *298. *277. *259. *259. *247. *243. *247. *231. *227. *221. *221. *221. *221. *221. *221. *221. *222. *222. *223. *	F COLL Y. FREO (PFR SFC) 3.40+07 2.445+07 1.49+07 4.16+06 4.05+06 9.51+05 2.10+05 9.51+04 4.70+04 4.70+04 4.70+04 7.44+03 7.43+03 7.77+02 9.33+01 7.69+01 1.52+01	0.000 5.272.00 8.809.400 1.104.401 1.224.401 1.313.401 1.334.401 1.334.401 1.334.01 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401 1.339.401
HEIGHT (KM) 0 5 10 15 20 35 40 45 50 65 67 75 70 75 90 110	1EMP (K) 210.0 184.9 159.9 139.4 136.1 132.9 129.6 120.0 116.8 113.7 110.7 110.9 97.8 94.6 91.4 88.2 85.0	PRESSURE (Mh) 5.00+00 3.02+00 1.70+00 8.74-01 4.28-01 2.07-01 9.83-02 2.11-02 2.11-02 2.13-03 1.23-03 1.23-03 1.23-03 1.23-03 1.23-04 3.23-04 1.31-04 5.22-05 8.02-06 3.09-06 4.88-07 9.70-06	0ENSITY (GM/CC) 1.26-05 6.66-06 5.64-06 5.32-06 6.24-07 4.01-07 1.92-07 4.20-08 1.91-06-08 4.20-08 1.91-06-08 6.65-10 2.69-10 1.08-10 1.67-11 1.67-11 1.62-12 4.40-12 4.05-13 4.20-14 4.26-14 1.67-14 4.05-13	SPEED OF SOUNC (M7SEC) 230. 217. 203. 190. 188. 196. 159. 177. 175. 123. 170. 168. 166. 165. 163. 160. 163. 166. 162.	MOLECULAR NEIGHT 44.0 44.0 44.0 44.0 44.0 44.0 44.0 44	DENS SCALF (KM) 14-16 10-85 7-32 7-18 7-03 6-72 6-72 6-72 6-72 6-72 6-72 6-72 6-72	PUMPER PENSITY (PEP CC) 1.72+17 1.18+17 7.72+16 4.54+16 2.28+16 2.28+16 1.13+26 5.463+15 1.24+15 1.24+15 2.61+14 1.17+14 2.61+14 2.61+14 1.17+14 2.61+14 2.74+12 2.74+12 1.52+12 6.14+11 2.45+11 6.16+10 8.76+10 9.76+10 9.76+10	MFAN FPEE PATH (M) P-*6-06 1-22-05 1-77-05 3-17-05 3-17-05 1-28-04 2-6-2-05 1-28-04 1-16-03 5-5-03 1-24-02 2-6-2-01 1-6-03 1-24-02 1-5-03 1-24-02 1-5-03 1-24-01 1-5-01	VIS- COSITY (F+c) 1.06 -91 -76 -65 -64 -62 -66 -65 -64 -65 -65 -64 -65 -65 -65 -65 -65 -65 -65 -65 -65 -65	PPES CCALF (KM) 10.5A 4.11 7.04 6.70 6.50 6.50 6.50 6.50 6.77 6.41 6.94 6.94 6.94 6.96	MEAN PARTICLY VELOCITY (M/SFC) 31A. 277. 254. 257. 247. 247. 231. 227. 221. 226. 221. 226. 247. 267. 267. 267. 267. 267. 267. 267. 26	F COLL Y. FREO (PFR SFC) 3.80+07 2.48+07 1.49+07 4.16+06 4.98+06 4.98+06 4.50+	0+000 5-272+00 8-809+00 1+104+01 1-283+01 1-313+01 1-327+01 1-339+01 1-339+01 1-339+01 1-339+01 1-339+01 1-339+01 1-339+01 1-339+01 1-339+01 1-339+01 1-339+01 1-339+01 1-339+01 1-339+01 1-339+01 1-339+01

TABLE III. - MODEL ATMOSPHERE FOR MARS - CONTINUED

170									_					
170 05:0 0:10 0:10 1.10 1.00 1.00 1.00 1.00 1.					٠٠.٠		12.25	7.04+07	3•_75+q4	. 44	12.40	329.	8.76-03	1.339+01
180							12.44	1.73+07	r. 75+04					1.339+01
200										44	12.00	332.		1.339+01
200								3.K?+(K	₹•0₽+Ue	• 4 4	13.00	334.	9.37-04	1.339+01
220 65:0 4.99-12 7.45-19 77. 16:0 13.92 7.324-15 4.04 13.75 355, 97.105 1.3 230 65:0 2.40-12 4.72-19 77. 16:0 13.44 1.70-15 2.71-16 4.0 17.40 335, 97.105 1.3 250 05:0 4.71-13 1.40-19 77. 16:0 13.44 1.70-15 2.12-16 4.0 17.40 335, 97.10-15 1.3 250 05:0 4.71-13 1.40-19 77. 16:0 13.55 7.04-10 3.57-10 4.0 17.40 335, 97.00-16 1.3 270 05:0 1.10-13 7.40-19 77. 16:0 13.55 7.04-10 3.57-10 4.0 17.50 335, 97.00-16 1.3 270 05:0 1.10-13 7.40-19 77. 16:0 13.55 7.04-10 3.57-10 4.0 17.73 355, 97.00-16 1.3 280 65:0 2.23-12 5.15-10 77. 16:0 13.57 7. 0.40-10 3.57-10 4.0 17.73 355, 97.00-10 1.3 280 65:0 7.00-10 1.10-13 7.40-19 77. 16:0 13.77 7. 0.40-10 3.70-10 3.77 7. 0.40-10 3.77 7. 0.40-10 3.70-10 3.77 7. 0.40-10 3.70-10 3.77 7. 0.40-10 3.70-10 3.77 7. 0.40-10 3.70-10 3.77 7. 0.40-10 3.70-10 3.70-10 3.77 7. 0.40-10 3.70-10 3.77 7. 0.40-10 3.70-1									F. 54+05	44.	13.21	335.	3.93-04	1.339+01
230 d5.0 2.00-1272-1871. 16.0 13.40 17.46 6.19.00										• 44	17.20	335.	1.95-04	1.339+01
$ \begin{array}{c} 240 \ 65 \cdot 6 9 \cdot 92 - 13 2 \cdot 26 - 10 2 \cdot 27 16 \cdot 9 \\ 250 \ 05 \cdot 10 4 \cdot 74 - 13 1 \cdot 10 \cdot 712 16 \cdot 10 13 \cdot 50 $. 11 14		335 •	9.71-05	1.330+01
250										• 11 17			4.13-05	1.339+01
200										• 11 4			1.97-05	1+339+01
270													9.40-06	1.339+01
280 65.0 5.70-18 1.21-19 4.7 16.0 13.81 1.52-10 44 13.61 335 1.07-80 1.7 290 05.0 2.58-10 1.25-10 2.7 16.0 13.81 1.52-10 44 13.61 335 1.05-60 1.7 290 05.0 2.58-10 1.25-10 2.7 16.0 13.80 1.21-10 44 13.61 335 1.05-60 1.7 300 05.0 1.25-11 1.30-20 247 16.0 13.62 1.21-10 2.13-10 44 13.61 335 2.40-67 1.3 310 05.0 6.15-15 1.30-20 247 16.0 14.10 1.22-10 2.75-10 44 14.10 335 1.22-07 1.3 320 85.0 3.02-15 1.30-20 17 16.0 14.11 2.58-10 5.66-10 44 14.11 325 5.90-98 1.3 330 85.0 1.40-15 1.36-21 4.7 16.0 14.11 2.58-10 5.66-10 44 14.11 335 5.90-98 1.3 340 85.0 7.38-16 1.67-21 4.7 16.0 14.10 1.27-10 1.33-10 44 14.27 335 1.46-08 1.3 350 85.0 3.67-16 2.31-22 24.7 16.0 14.20 7.13-10 4.61-10 4.4 14.27 335 7.08-08 1.3 360 85.0 3.67-16 2.31-22 24.7 16.0 14.20 7.13-10 4.61-10 4.4 14.27 335 7.08-08 1.3 370 85.0 9.17-17 7.06-22 247 16.0 14.20 7.13-10 4.61-10 4.41 14.10 335 7.08-09 1.3 380 85.0 2.32-17 7.08-22 24.7 16.0 14.20 7.13-10 4.61-10 4.41 14.10 335 7.08-09 1.3 380 85.0 9.17-17 7.06-22 24.7 16.0 14.20 7.13-10 4.61-10 4.41 14.10 335 7.08-09 1.3 380 85.0 9.17-17 7.06-22 24.7 16.0 14.50 7.74-10 4.04-11 4.44 14.50 335 7.08-09 1.3 380 85.0 9.17-17 7.06-22 24.7 16.0 14.50 7.49-10 4.04-11 4.44 14.50 335 7.08-00 1.3 380 85.0 9.17-17 7.06-22 24.7 16.0 14.50 7.49-10 4.04-11 4.44 14.50 335 7.08-00 1.3 380 85.0 9.52-17 1.30-22 34.7 16.0 14.50 7.49-10 4.64-11 4.44 14.50 335 9.14-10 1.3 400 85.0 1.10-17 7.06-23 74.7 16.0 14.50 7.49-10 4.49-11 4.49 14.50 335 9.14-10 1.3 410 85.0 5.99-16 1.35-23 24.7 16.0 14.65 7.00-10 7.00-11 1.44-12 4.4 14.10 1.3 420 85.0 3.65-12 8.40-24 24.7 16.0 14.97 1.33-10 1.06-11 4.41 4.41 4.41 4.41 4.41 4.41 4.41 4														1.339+01
290														1.339+01
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310														1.339+01
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330	320													1.339+01
340 db.0 7.38-16 1.c7-21 (.7. 16.0 14.27 6.041) 2.2910 44 14.27 335 1.46-08 1.3 350 db.0 3.67-16 5.31-22 247. 16.0 14.27 3.3410 4.6110 4.4 14.27 335, 7.9a-09 1.3 350 db.0 1.67-16 6.14-22 247. 16.0 14.20 7.13410 4.6110 4.4 14.27 335, 7.9a-09 1.3 370 db.0 91.7-17 7.06-22 47. 16.0 14.50 7.91+00 1.04+11 44 14.50 335, 1.82-09 1.3 380 db.0 91.7-17 1.08-22 47. 16.0 14.50 7.91+00 1.04+11 44 14.50 335, 1.82-09 1.3 390 db.0 2.32-17 6.26-23 247. 16.0 14.50 7.91+00 1.04+11 44 14.50 335, 9.14-10 1.3 400 db.0 5.98-16 1.35-23 2.7. 16.0 14.66 1.00+00 7.20+11 44 14.50 335, 4.61-10 1.3 410 db.0 5.98-16 1.35-23 2.7. 16.0 14.67 1.00+00 1.44+12 44 14.73 335, 2.33-10 1.3 420 db.0 1.19-17 7.06-23 7.7. 16.0 14.67 1.00+10 1.44+12 44 14.73 335, 2.33-10 1.3 420 db.0 3.05-10 1.00-24 247. 16.0 14.91 1.00+10 1.00+12 44 14.74 335, 3.61-10 1.3 420 db.0 3.05-10 1.50-10 1.7.5-23 2.7. 16.0 14.91 1.00+12 2.03+12 44 14.73 335, 2.33-10 1.3 420 db.0 3.05-10 1.50-10 1.7.5-24 70.7. 16.0 14.91 1.00+12 2.03+12 44 14.81 335, 1.10-10 1.3 430 db.0 3.05-10 1.50-10 1.7.5-24 70.7. 16.0 14.91 1.00+12 44 14.97 335, 3.61-11 1.3 440 db.0 3.0 1.50-10 1.7.5-24 70.7. 16.0 15.70 1.31-01 1.00+13 44 14.97 335, 3.69-11 1.3 450 db.0 2.13-19 1.01-24 267. 16.0 15.70 1.31-01 1.00+13 44 14.97 335, 1.50-11 1.3 450 db.0 2.13-19 1.21-24 267. 16.0 15.70 1.50-11 1.3 450 db.0 2.13-19 1.21-25 247. 16.0 15.70 1.50-10 1.00+13 44 15.12 335, 1.40-12 1.3 460 db.0 2.13-19 1.50-25 247. 16.0 15.70 1.50-13 1.00+13 44 15.12 335, 1.40-12 1.3 470 db.0 5.0 1.11-19 2.51-25 247. 16.0 15.70 0.40-03 1.52-11 4.4 15.12 335, 1.40-12 1.3 490 db.0 5.0 1.12-13 14 0.75-25 247. 16.0 15.70 0.40-03 1.52-11 4.4 15.2 335, 2.20-12 1.3 490 db.0 5.0 1.50-20 1.31-25 247. 16.0 15.70 0.40-03 1.52-11 4.4 15.20 335, 2.20-12 1.3 490 db.0 5.0 1.50-20 1.31-25 247. 16.0 15.50 0.40-03 1.52-11 4.4 15.20 335, 2.20-12 1.3 500 db.0 1.50-20 7.50-20 1.31-25 247. 16.0 15.50 0.40-03 1.52-11 4.4 15.20 335, 2.20-12 1.3 500 db.0 1.50-20 7.50-20 1.31-25 2.77 16.0 15.50 0.40-03 1.52-11 4.4 15.20 335, 2.20-12 1.3 500 db.0 1.50-20 7.50-2														1.339+01
350 db.0 3.67-16 5.31-22 247. 16.0 14.20 7.13+01 4.64+10 40 9.33 35. 7.98-09 1.3 370 db.0 1.03-16 4.14-22 207. 16.0 14.42 1.56/01 9.04+11 40.40 3.35. 7.68-09 1.3 370 db.0 9.17-17 7.06-22 747. 16.0 14.42 1.56/01 9.04+11 40.50 3.35 1.69-00 1.3 380 db.0 9.17-17 1.08-22 247. 16.0 14.67 7.01+00 1.04+11 40.50 3.35 1.08-00 1.3 380 db.0 2.52-17 5.26-23 207. 16.0 14.66 1.03+01 7.09+11 40.40 14.50 3.35 9.14-10 1.3 400 db.0 2.52-17 5.26-23 207. 16.0 14.66 1.03+01 7.09+11 40.40 14.50 3.35 9.14-10 1.3 410 db.0 5.98-16 1.35-23 2.77 16.0 14.73 1.00+00 1.44+12 40.4 14.73 3.5 2.33-10 1.3 420 db.0 1.19-17 7.06-23 70.7 16.0 14.73 1.00+00 1.44+12 40.4 14.73 3.5 2.33-10 1.3 420 db.0 1.50-18 1.35-23 2.77 16.0 14.91 7.40-00 1.44+12 40.4 14.73 3.5 1.10-10 1.3 420 db.0 3.05-18 1.03-23 2.77 16.0 14.97 1.33-01 1.06+13 40.80 3.05-18 1.03-10 1.3 440 db.0 4.01-19 1.21-24 24.7 16.0 14.97 1.33-01 1.06+13 40.80 3.25 6.45-11 1.3 450 db.0 1.15-18 7.3-24 20.7 16.0 15.04 14.87 1.33-01 1.06+13 40.4 14.80 3.35 1.00-11 1.3 450 db.0 2.13-19 1.21-24 247 16.0 15.01 1.39-07 2.02+13 40.4 16.10 3.35 1.00-11 1.3 450 db.0 2.13-19 1.21-25 247 16.0 15.02 2.02+13 40.4 15.10 3.5 1.00-11 1.3 450 db.0 5.0 4.13-19 2.51-25 20.7 16.0 15.12 3.59-20 4.10+13 40.4 15.10 3.5 1.00-11 1.3 450 db.0 5.0 4.13-19 2.51-25 20.7 16.0 15.12 3.59-20 4.10+13 40.4 15.20 3.35 1.00-11 1.3 450 db.0 5.07-20 (.62-26 20.7 16.0 15.92 0.00-13 3.5+14 40.4 15.20 3.35 1.00-12 1.3 450 db.0 5.0 6.56-22 3.40-27 20.7 16.0 15.36 4.91-03 2.02+14 40.4 15.20 3.35 2.20-12 1.3 550 db.0 6.56-22 3.40-27 20.7 16.0 15.92 2.50-20 4.10+13 40.4 15.10 3.35 2.20-12 1.3 550 db.0 6.56-22 3.40-27 20.7 16.0 15.92 2.50-20 4.10+13 40.4 15.10 3.35 2.20-12 1.3 550 db.0 6.56-22 3.40-27 20.7 16.0 15.92 2.50-20 2.7 16.0 15.92 4.10-12 4.04 15.30 3.35 2.20-12 1.3 550 db.0 6.56-22 3.40-27 20.7 16.0 15.92 2.50-20 2.7 16.0 15.92 4.10-12 4.04 15.30 3.35 2.20-12 1.3 550 db.0 6.56-22 3.40-27 20.7 16.0 15.92 2.50-20 2.7 16.0 15.92 4.10-12 4.04 15.30 3.35 2.20-12 1.3 550 db.0 6.56-22 3.40-27 20.7 16.0 15.92 2.50-20 2.7 16.0 16.70 2.50	340	85.Q	7.38-16											1.339+01
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400 85.0 2:13-19 4.73-25 247. 16.0 15.12 3.62-20 4.10+13 4.4 16.12 336. 4.23-12 1.3 40 85.0 1:11-19 2:51-25 247. 16.0 15:20 0.44-03 1.52-13 4.4 16.20 336. 4.23-12 1.3 40 85.0 5:77-20 1.31-25 217. 16.0 15:20 0.44-03 1.53+14 4.4 16.20 336. 2.70-12 1.3 40 85.0 3.01-20 (-82-26 247. 16.0 15.34 4.63-03 2.03+14 4.4 16.36 336. 1.14-12 1.3 500 85.0 1.56-20 3.06-26 247. 16.0 15.92 1.56-20 3.07+15 4.4 16.30 33.5 5.07-13 1.3 500 85.0 1.56-22 1.40-77 247. 16.0 15.52 1.56-20 3.07+16 4.4 16.30 33.5 5.07-13 1.3 6.0 85.0 2.95-23 6.69-29 247. 16.0 15.92 1.56-20 3.07+16 4.4 16.30 33.5 5.07-13 1.3 6.0 85.0 1.44-24 3.25-30 247. 16.0 16.33 2.59-66 5.73-17 4.4 16.30 33.5 5.06-16 1.3 6.0 85.0 1.44-24 3.25-30 247. 16.0 16.70 1.22-07 3.14-19 4.4 16.30 33.5 5.06-16 1.3 7.00 85.0 7.52-26 1.70-31 247. 16.0 16.70 1.22-07 3.14-19 4.4 16.30 33.5 1.47-19 1.3 7.00 85.0 7.52-26 1.70-31 247. 16.0 17.16 4.41-10 2.25+20 4.41 17.16 33.5 1.49-18 1.3 7.00 85.0 4.23-27 0.77-33 247. 16.0 17.16 4.41-10 2.25+20 4.41 17.16 33.5 1.49-18 1.3 7.00 85.0 1.42-25 5.76-34 247. 16.0 18.50 2.15-10 4.00-12 4.41 17.50 335. 4.79-18 1.3 800 85.0 1.62-32 7.71-35 247. 16.0 18.50 2.17-14 1.64-12 4.41 17.50 335. 4.79-18 1.3 800 85.0 1.42-32 7.71-35 247. 16.0 18.50 2.17-14 1.64-12 4.41 17.50 335. 3.75-22 1.3 850 85.0 1.42-30 3.71-35 247. 16.0 18.44 1.40-12 1.71-32-4 4.41 17.50 335. 3.75-22 1.3 950 85.0 8.21-32 1.66-37 247. 16.0 18.44 1.40-12 1.71-32-4 4.41 17.50 335. 3.75-22 1.3 950 85.0 8.21-32 1.66-37 247. 16.0 18.44 1.40-12 1.71-32-4 4.41 17.88 335. 3.25-22 1.3 950 85.0 8.21-32 1.86-37 247. 16.0 18.44 1.40-12 1.71-24-25 4.44 17.40-33 335. 1.65-25 1.3 950 85.0 8.21-32 1.86-37 247. 16.0 19.37 7.00-15 2.06-26 4.44 19.37 335. 1.26-25 1.3 950 85.0 6.56-33 1.44-38 247. 16.0 19.37 7.00-15 2.06-26 4.44 19.37 335. 1.46-25 1.3 950 85.0 6.56-33 1.44-38 247. 16.0 19.37 7.00-15 2.06-26 4.44 19.37 335. 1.46-25 1.3 950 85.0 6.56-33 1.44-38 247. 16.0 19.37 7.00-15 2.06-26 4.44 19.37 335. 1.26-25 1.3 950 85.0 6.56-33 1.44-38 247. 16.0 19.37 7.00-15 2.06-26 4.44 19.37 335. 1.26-25 1.3 950									2 • 11 + 13	44	15.04	335.		1.339+01
470 85.0 1.11-19 2.51-25 207. 16.0 15.2F 0.40-03 3.52+14 44 15.26 335. 2.50-12 1.3 480 85.0 5.77-20 1.31-55 207. 16.0 15.46 2.52-14 44 15.26 335. 2.50-12 1.3 500 85.0 3.01-20 (.82-26 207. 16.0 15.46 2.52-16 3.64-14 44 15.36 335. 1.14-12 1.3 500 85.0 1.58-20 3.58-26 207. 16.0 15.47 2.52-16 2.52-16 4.0 15.59 1.52-17 1.3 550 85.0 6.56-22 1.40-77 207. 16.0 15.59 1.52-03 1.77-15 40 15.59 2.50-13 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1										• 44	15.12	775.		1.339+01
480 85.0 5.77-20 1.31-25 217. 16.0 15.36 4.41-13 2.02+14 44 16.36 335. 1.14-12 1.3 490 85.0 3.01-20 (.62-26 207. 16.0 15.49 (.57-03 5.61+14 44 16.44 335. 5.07-13 1.3 500 85.0 1.58-20 3.58-26 207. 16.0 15.59 1.58-20 3.07+15 44 16.52 335. 3.13-13 1.3 550 85.0 6.56-22 1.49-27 247. 16.0 15.59 1.58-20 5.28+16 44 16.92 335. 1.79-14 1.3 650 85.0 2.95-23 6.69-29 247. 16.0 16.73 2.58-206 5.72+17 44 16.33 335. 5.66-16 1.3 650 85.0 1.44-24 3.55-30 247. 16.0 16.73 2.58-206 5.72+17 44 16.33 335. 5.66-16 1.3 700 85.0 7.52-26 1.70-31 247. 16.0 16.73 1.29-07 1.10+19 44 16.74 335. 2.58-17 1.3 750 85.0 4.23-27 0.57-33 247. 16.0 17.16 6.41-19 2.25+20 40 17.16 335. 1.49-18 1.3 800 85.0 2.55-28 5.76-34 247. 16.0 17.50 3.60-10 4.00+21 444 17.58 335. 8.38-20 1.3 850 85.0 1.64-29 3.71-35 247. 16.0 18.48 1.40-12 1.73+24 44 18.01 335. 5.65-21 1.3 850 85.0 1.60-29 3.71-35 247. 16.0 18.48 1.40-12 1.73+24 44 18.03 335. 3.25-20 1.3 850 85.0 1.60-29 3.71-35 247. 16.0 18.48 1.40-12 1.73+24 44 18.80 335. 2.25-20 1.3 850 85.0 1.62-30 3.71-35 247. 16.0 18.48 0.50-10 4.50+25 44 18.80 335. 2.25-20 1.3 850 85.0 8.21-32 1.86-37 247. 16.0 18.48 0.50-15 2.06+26 44 18.80 335. 2.25-23 1.3 950 85.0 8.21-32 1.86-37 247. 16.0 19.33 7.00-15 2.06+26 44 19.48 335. 1.63-24 1.3													4 - 23 - 12	1.339+01
490 85.0 3.01-20 (-82-26 207. 16.0 15.49 (-67-03 5.61)+18 .44 15.37 35. 1.44-12 1.7 500 85.0 1.56-20 3.06-26 207. 16.0 15.52 1.76-03 3.07)+15 .44 15.52 335. 3.13-13 1.3 500 85.0 1.56-22 1.40-77 207. 16.0 15.52 1.76-03 3.07)+15 .44 15.92 335. 1.76-14 1.3 600 85.0 2.95-23 6.69-29 247. 16.0 16.33 2.59-06 5.73-17 .44 16.33 335. 5.66-16 1.3 650 85.0 1.44-24 3.95-30 247. 16.0 16.78 1.29-07 3.10-19 .44 16.33 335. 5.66-16 1.3 700 85.0 7.52-26 1.70-31 247. 16.0 16.78 1.29-07 3.10-19 .44 16.33 335. 2.85-17 1.3 750 85.0 4.23-27 9.57-33 247. 16.0 17.56 3.60-10 4.00-21 .44 17.56 335. 1.49-18 1.3 800 85.0 2.55-28 5.66-34 247. 16.0 17.56 3.60-10 4.00-21 .44 17.56 335. 1.49-18 1.3 850 85.0 1.64-29 3.71-35 247. 16.0 18.48 1.40-12 1.73-24 .44 18.83 335. 3.55-22 1.3 850 85.0 1.42-30 3.71-35 247. 16.0 18.48 1.40-12 1.73-24 .44 19.45 335. 3.55-22 1.3 950 85.0 8.21-32 1.66-37 247. 16.0 18.48 1.40-12 1.73-24 .44 19.45 335. 3.55-22 1.3 950 85.0 8.21-32 1.66-37 247. 16.0 18.48 1.40-12 1.73-24 .44 19.45 335. 3.25-22 1.3 950 85.0 8.21-32 1.66-37 247. 16.0 18.48 1.40-12 1.73-24 .44 19.45 335. 3.25-22 1.3 950 85.0 8.21-32 1.66-37 247. 16.0 19.37 7.00-15 2.06-26 .44 19.37 335. 1.67-24 1.3 950 85.0 8.21-32 1.66-37 247. 16.0 19.37 7.00-15 2.06-26 .44 19.37 335. 1.67-24 1.3 950 85.0 6.56-33 1.44-38 247. 16.0 19.78 5.42-16 2.66-27 .44 19.78 335. 1.26-25 1.3														1.339+01
500 85.0 1.58-20 3.56-22 207. 16.0 15.62 1.78-03 1.77-15 44 15.52 355. 3.61-13 13. 3.55 3.61-13 13. 3.55 85.0 6.56-22 1.40-27 207. 16.0 15.92 5.50-05 2.58+16 44 15.52 355. 3.61-13 13. 3.600 85.0 2.43-23 6.69-28 247. 16.0 16.73 5.52-17 .44 16.33 335. 5.66-16 13. 650 85.0 1.44-24 3.75-30 247. 16.0 16.74 1.22-07 1.18+19 44 16.33 335. 5.86-16 13. 700 85.0 7.52-26 1.70-31 247. 16.0 17.16 6.41-19 2.25+20 44 17.16 33. 335. 2.85-17 13. 750 85.0 4.23-27 6.57-33 247. 16.0 17.16 6.41-19 2.25+20 44 17.16 335. 1.49-18 13. 800 85.0 4.23-27 8.75-33 247. 16.0 17.56 3.60-10 4.00+21 4.4 17.59 335. 4.98-20 13. 800 85.0 1.64-29 3.71-35 247. 16.0 18.01 2.17-16 4.64-22 4.44 17.59 335. 8.98-20 13. 850 85.0 1.62-29 3.71-35 247. 16.0 18.48 1.40-12 1.72+2 44 18.88 335. 3.55-22 1.30 90 85.0 1.12-30 2.55-36 247. 16.0 18.88 0.50-14 1.50+25 4.44 18.88 335. 3.25-22 1.30 950 85.0 8.21-32 1.66-77 247. 16.0 18.88 0.50-14 1.50+25 4.44 18.88 335. 3.25-22 1.30 950 85.0 8.21-32 1.66-77 247. 16.0 19.37 5.40-14 1.50+25 4.44 18.88 335. 2.23-23 1.30 950 85.0 6.36-33 1.44-38 247. 16.0 19.37 5.42-16 2.66+27 4.44 19.37 335. 1.26-25 1.30 1000 85.0 6.36-33 1.44-38 247. 16.0 19.37 5.42-16 2.66+27 4.44 19.37 335. 1.26-25 1.30														1.339+01
550 85.0 6.56-22 1.40-27 2.67. 16.0 15.92 5.50-15 2.58+16 41 15.92 3.5. 3.13-13 1.3. 600 85.0 2.45-23 6.69-29 247. 16.0 16.73 2.52-16 5.73+17 44 16.93 3.55 1.50-14 1.3. 700 85.0 7.52-26 1.70-31 247. 16.0 17.16 6.41-09 2.25+20 440 16.73 3.5. 5.66-16 1.3. 750 85.0 7.52-26 1.70-31 247. 16.0 17.16 6.41-09 2.25+20 440 17.16 3.35 1.49-18 1.3. 800 85.0 2.55-28 5.76-34 247. 16.0 17.57 3.60-10 4.00+21 44 17.58 3.55 8.38-20 1.3. 850 85.0 1.64-29 7.71-35 247. 16.0 18.07 2.17-11 6.64+22 4.04 18.07 1														1.339+01
600 85.0 2.45-23 6.69-29 247. 16.0 16.38 2.52-06 8.72+17 .44 16.33 335. 1.91-14 1.3 650 85.0 1.44-24 3.25-30 247. 16.0 16.78 1.22-07 1.12+19 .44 16.33 335. 2.85-17 1.3 700 85.0 7.52-26 1.70-31 247. 16.0 17.16 6.41-09 2.25+20 .40 17.16 335. 2.85-17 1.3 750 85.0 4.23-27 0.57-33 247. 16.0 17.16 6.41-09 2.25+20 .40 17.16 335. 1.49-18 1.3 800 85.0 2.55-28 5.76-34 247. 16.0 18.01 2.17-11 6.64+22 .44 17.58 335. 1.49-18 1.3 850 85.0 1.62-29 3.71-35 247. 16.0 18.48 1.40-12 1.72+24 .44 17.58 335. 3.55-20 1.3 950 85.0 8.21-32 1.66-77 247. 16.0 18.88 0.55-14 1.50+25 .40 18.88 335. 2.23-23 1.3 950 85.0 8.21-32 1.66-77 247. 16.0 19.37 5.40-14 1.50+25 .40 18.88 335. 2.23-23 1.3 950 85.0 8.21-32 1.66-77 247. 16.0 19.37 5.40-14 1.50+25 .40 18.88 335. 2.23-23 1.3 950 85.0 8.21-32 1.66-77 247. 16.0 19.37 5.40-14 1.50+25 .40 18.83 335. 1.63-24 1.3 950 85.0 6.36-33 1.44-38 247. 16.0 19.37 5.42-16 2.66+27 .44 19.37 335. 1.26-25 1.3														1.339+01
650 85.0 1.44-24 3.25-30 247. 16.0 16.74 1.22-07 3.16+19 444 16.74 335. 2.75-17 13. 700 85.0 7.52-26 1.70-31 247. 16.0 17.16 6.41-09 2.25+20 444 17.16 335. 1.49-18 1.3 750 85.0 4.23-27 0.57-33 247. 16.0 17.16 6.41-09 2.25+20 444 17.16 335. 1.49-18 1.3 800 85.0 2.55-28 5.76-34 247. 16.0 18.01 2.17-11 6.64+22 444 18.01 3.55. 1.49-18 1.3 850 85.0 1.69-29 3.71-35 247. 16.0 18.45 1.40-12 1.02+22 444 18.45 335. 3.25-20 1.3 950 85.0 1.12-30 2.55-36 247. 16.0 18.45 1.40-12 1.50+25 4.44 18.45 335. 3.25-20 1.3 950 85.0 8.21-32 1.46-37 247. 16.0 19.33 7.00-15 2.06+26 4.44 18.88 335. 2.23-23 1.3 950 85.0 8.21-32 1.46-37 247. 16.0 19.33 7.00-15 2.06+26 4.44 18.48 335. 3.25-20 1.3 1000 85.0 6.36-33 1.44-38 247. 16.0 19.33 7.00-15 2.06+26 4.44 19.33 335. 1.63-24 1.3														1.339+01
700 85.0 7.52-26 1.70-31 247. 16.0 17.16 6.41-09 2.25+20 44 17.16 335. 14.9-18 1.37 750 85.0 4.23-27 9.57-33 247. 16.0 17.56 3.60-10 4.00421 44 17.56 335. 14.9-18 1.37 880 85.0 2.55-28 5.6-54 247. 16.0 18.01 2.17-11 6.64+22 4.4 17.56 335. 8.38-20 1.3 850 85.0 1.64-29 3.71-35 247. 16.0 18.45 1.40-12 1.73+24 44 19.45 335. 3.25-22 1.3 900 85.0 1.12-30 2.55-36 247. 16.0 18.98 7.50-12 1.73+24 44 19.45 335. 3.25-22 1.3 950 85.0 8.21-32 1.86-37 247. 16.0 18.98 7.50-15 2.06+26 4.4 19.45 335. 2.23-23 1.3 950 85.0 8.21-32 1.86-37 247. 16.0 19.93 7.50-15 2.06+26 4.4 19.33 335. 1.63-24 1.3 1000 85.0 6.36-33 1.44-38 247. 16.0 19.78 5.42-16 2.66+27 44 19.78 335. 1.26-25 1.3	650													1 • 339+01
750 85.0 4.23-27 9.57-33 247. 16.0 17.58 3.60-10 4.01-21 44 17.58 335. 4.39-10 13. 800 85.0 2.55-28 5.76-34 247. 16.0 18.01 2.17-11 6.64+22 44 18.01 335. 5.05-21 13. 850 85.0 1.64-29 3.71-35 247. 16.0 18.45 1.40-12 1.03+24 44 18.01 335. 5.05-21 13. 900 85.0 1.12-30 2.55-36 247. 16.0 18.45 1.40-12 1.03+24 44 18.01 335. 3.25-22 13. 950 85.0 8.21-32 1.66-37 247. 16.0 18.45 1.65-25 1														1.339+01
800 85.0 2.55-28 5.76-34 247. 16.0 18.01 2.17-11 6.64+22 .44, 16.01 33.5 5.05-21 1.3. 850 85.0 1.66-29 3.71-35 247. 16.0 18.45 1.40-12 1.62+24 .44 18.45 335. 3.25-22 1.3. 900 85.0 1.12-30 2.55-36 247. 16.0 18.45 0.50-14 1.50+25 .44 18.46 335. 3.25-22 1.3. 950 85.0 8.21-32 1.86-37 247. 16.0 19.33 7.00-15 2.06+26 .44 18.48 335. 2.23-23 1.3. 1000 85.0 6.36-33 1.44-38 247. 16.0 19.37 5.42-16 2.66+27 .44 19.78 335. 1.26-25 1.3.	750	85.0	4.23-27											_1.339+01 .
85.0 85.0 1.64-29 3.71-35 247. 16.0 18.45 1.40-12 1.72+24 .44 18.45 335. 3.25-22 1.3. 900 85.0 1.12-30 2.55-36 247. 16.0 18.82 0.50-14 1.50+25 .41 18.88 335. 2.23-23 1.3. 950 85.0 8.21-32 1.66-37 247. 16.0 19.37 7.00-15 2.06+26 .44 18.33 335. 1.63-24 1.3. 1000 85.0 6.36-33 1.44-38 247. 16.0 19.78 5.42-16 2.66+27 .44 19.78 335. 1.26-25 1.3.	800	გ2∙0	2.55-28	5.76-34										1.339+01
900 85.0 1.12-30 2.55-36 247. 16.0 18.89 0.50-14 1.50+25 .444 18.88 335. 2.23-23 1.33 950 85.0 8.21-32 1.66-37 247. 16.0 19.33 7.00-15 2.06+26 .44 19.33 7.35. 1.63-24 1.33 1000 85.0 6.36-33 1.44-38 247. 16.0 19.78 5.42-16 2.66+27 .44 19.78 335. 1.26-25 1.33		85.0												1.339+01
950 85.0 8.21-32 1.86-37 247. 16.0 19.33 7.00-15 2.06+26 .44 10.33 335. 1.63-24 1.31 1000 85.0 6.36-33 1.44-38 247. 16.0 19.78 5.42-16 2.66+27 .44 10.78 335. 1.26-25 1.31		85.0	1-12-30	2.55-36	247.									1 • 339+01 1 • 339+01
1000 85.0 6.36-33 1.44-38 247. 16.0 19.78 5.42-16 2.66+27 .44 10.78 335. 1.26-25 1.33		85.0	8 • 21 - 32		247.									1.339+01
The state of the s	1000	<u>85.</u> 0	6 • 36 - 33	1.44-38	247.									1.339+01
		COLUM	NAR FASS =	13.395	G₩√CC			COLUMNAR W	ASS FOR COZ	= _13.				_ 1.*DU 7.*UL .
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TABLE III. - MODEL ATMOSPHERE FOR MARS - CONTINUED

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				MODEL	ATMOSPHER	RE FOP MA	R5			1 OWER		
CONSTRUCT	ION PAR	AMETERS		,	FNGINEERIN	NG INTTS					ATF 9/20/	67
									-		-	
										-		
SURFACE F	RESSURE	= .073	LB/SG IN_	SUPFACE	TEMPERATUR	RE = 378	0 P	SUPFACE D	FNSITY =	2.45-05	SLUG/CII I	E7
PER CENT	CARBON	DIOXIDE = 10	0.0	MOLFCULA	P WEIGHT :	= 44.01		SURFAC	FGRAVITY	= 12.30	FT/SFC/SI	FC
												
·												
									~	-		
CALCULATED	QUANTI	TIES										
									MEAN	MEAN		
HEIGHT	TEMP	PRESSURE	DENSITY (SLUG/	OF SOUND	SPECIFIC WEIGHT	CCALE DDEC	DENS	DENSITY	PARTICLE	FRFF - Path	OSITY	KINETIC VISC
(MIL.FT)	(R)	(LR/S0 IN)	CU FT)	(FT/SFC)			FT)	PEP CU ET	(FT/SEC)	(FT)	(F+5)	V13C
•0000	378.0	7.26-02	2.45-05	756•	3.0-04	.035	.046	4.9+21	1043.	2.7-05	2.22	9-1-03
•0164 •0328	332.9	4 • 39 = 02	1.68-05	713.	3.0-04	•031	•041	3 - 4+21	079.	4.0-05	1.91	1-1-02
•0492	250.8	2 • 47 = 02 1 • 27 = 02	1.10-05 6.45-06	666 • 624 •	3.0-04	.027	•036 •024	2 • 2 + 2 1	910.	6-1-05	1.59	1.5-02
•0656	245.0	6.22-03	3.24-06	617.	3.0-04	.023	uSa	6.5+20	840 ·	1 • 0 = 04 2 • 1 = 04	1.36 1.33	2 • 1 - 0 2 4 • 1 - 0 2
•0820	239•2	3-00-03	1.60-06	610.	3.0-04	• 055	•023	3.2+20	0.59	4.2-04	1.30	8.1-02
• 0984	233+4	1-43-03	7.20-07	¥U.∡•	3.0-04	.022	.023	1.6+20	A1q.	A • 6-04	1.27	1.6-01
•1148 •1312	227.6	6.67÷04 3.06=04	3.74-07	589.	2.9-04	•021	• 655	7.5+10	809.	1.8-03_	1+24	3-3-01
•1476	216.1	1.38-04	8-16-09	582	2.0-04	.021 .020	120.	3.5+10 1.6+10	799 • 788 •	3.8-03 8.2-03	1.21	6•9 - 01 1•4+00
•1640	210.3	6 • 12 - 05	3.71-0A	574.	2.0-04	.020	•021	7.4+18	778•	1.8-02	1.15	3-1+00
•1805	204.6	2.65-05	1.65-08	567•	2.9-04	.019	•020	3.3+18	767•	4-1-02	1.12	6.8+00
•1969 •2133	198 • 9 193 • 2	1.13-05	7.23-09	559•	2.9-04	.010	• <u>05</u> 0	1.4+18	756•	9.3-02	1.00	1.5+01
•2133	187.5	4 • 68 - 06 1 • 90 - 06	1.29-09	551 •	2.9-04	.018 .018	·019	6.2+17	746	3.2-01 _	1•07_	3.5+01
.2461	181.8	7.57-07	5.22-10	540.	2.9-04	.018	.018	2•6+17 1•1+17	735• 720•	5•2-01 1•3+00	1.04	8•1+01 1•9+02
•2625	176 • 0	2.99-07	2.09-10	536 •	2.9-04	•01A	• N1P	4 • 3 + 16	724	3.1+00	99	4.8+02
•2789	170 • 2	1.16-07	8 • 28 - 11	535.	2.9-04	.017	•018	1.7+16	718•	7.7+00_	-98	1.2+03
•2953	164.5	4 - 48 - 08	3-24-11	525•	2.9-04	.017	•017	6.9+15	712.	1.0+01	•96	3.0+03
•3117 •3281	158•7 153•0	1.75-08 7.08-09	4.73-12	535 • 546 •	2.9-04	•01P	•017	2 • 8 + 15	726	4 • 9+01	•94	7.8+03
•3609	153.0	1.41-09	7.86-13	507.	2.0-04	.019 .022	•n18	1 • 2 + 15 2 • 3 + 14	741 • 811 •	1 • 1 + n2 5 • 7 + n2	•93	2 • 0 + 0 4
• 3937	153.0	3.53-10	1.76-13	633	2.8-04	.025	.023	5.9+13	850	2.3+03	•93. •93	1 • 2 + 05 5 • 3 + 05
•4265	153 • 0	1.04-10	4.57-14	675•	2.8-04	020	• 026	1.7+13	915	7.7+03	93	2.0+06
4593	153.0	3-62-11	1.37-14	726.	2.8-04	• 034	• 029	6.0+12	985.	2.2+04	•93	6 · A+06
•4921	153.0	1 • 47 - 11	4.71-15	790.	2.8-04	<u>.040</u>	•033	2.5+12		5.5+04	93	2.0+07
•5250 •5578	153.0	6.54-12	2.07-15	794.	2.7-04	• 041	•040	1 • 1 + 12	1078•	1.2+05	•93	4.5+07
	153·0 153·0	2.94-12	4.14-16	709.	2.7-04	041	-041	4 • 9 + 1 1	1084 -	2.7+05	93	1.0+08
	153.0	6 • 16 - 13	1.89-16	907.	2.7-04	.042	.041 042	2 • 2 + 1 1	1089• 1095•	6•0+05 1•3+06	.93	2.2+08
•5906 •6234			8.71-17	P11.	2.7-04	.043	043	4.8+10		2.8+06	•93	4.9+08 1.1+09
•6234 •6562	153.0	2-67-13										
•6234 •6562 •6890	153.0	1.35-13	4.09-17	811.	2.7-04	• 044	• 044	2.2+10		6.0+06	• 93	
•6234 •6562					2 • 7 = 04 2 • 7 = 04 2 • 6 = 04				110n• 110n•			2.3+09 4.8+09

TABLE III. - MODEL ATMOSPHERE FOR MARS - CONCLUDED

*** **********************************	.8859 153-0 3.30-15 1.00-18 a11. 2.6-04 a045 a045 c.6458 a100 5.4-08 a3 9.341 s8859 353-0 1.69-15 a10-11 2.6-04 a045 a045 c.6458 a100 5.1-06 a3 a401 s915 353-0 3.74-16 a11. 2.6-04 a045	•8202	153.0	6.88-15	2.09-18	R11+	2.6-04	.045	045	1.1+00	1100-	1.2+08	• 9.3	4.4+1
**************************************	.8859 153-0 1-59-15 4-82-19 211 2-6-04 0.04 0.04 1.3-01 10.0 1.0-10 0.04 0.04 1.3-04 10.0 1.0-10 0.													
9187 153-0 7.70-16 2.33-10 011 2.6-04 046 046 0.46 0.2207 1101 2.2209 03 6.221 0.2105 0.2209 0.3 6.221 0.2105 0.2209 0.3 6.221 0.2105 0.2209 0.3 6.221 0.2210 0.2209 0.3 6.221 0.2210 0.2209 0.3 6.221 0.2210 0.2209 0.3 6.221 0.2210 0.2209 0.3 0.221 0.2210 0.2209 0.3 0.221 0.2210 0.2209 0.3 0.221 0.2210 0.2209 0.3 0.221 0.2210 0.2209 0.3 0.221 0.2209 0.3 0.221 0.2209 0.3 0.221 0.2209 0.3 0.221 0.2209 0.3 0.221 0.2209 0.3 0.221 0.2209 0.2	9187 153-0 7.70-16 2.33-10 011 2.6-04 046 046 0.46 0.2207 1101 2.2209 03 6.221 0.2105 0.2209 0.3 6.221 0.2105 0.2209 0.3 6.221 0.2105 0.2209 0.3 6.221 0.2210 0.2209 0.3 6.221 0.2210 0.2209 0.3 6.221 0.2210 0.2209 0.3 6.221 0.2210 0.2209 0.3 0.221 0.2210 0.2209 0.3 0.221 0.2210 0.2209 0.3 0.221 0.2210 0.2209 0.3 0.221 0.2210 0.2209 0.3 0.221 0.2209 0.3 0.221 0.2209 0.3 0.221 0.2209 0.3 0.221 0.2209 0.3 0.221 0.2209 0.3 0.221 0.2209 0.2													
.9515 153-0 3.74-16 1.13-19 01. 2.6-04 .046 6.2407 1100 2.24-09 .03 8.241 1.9643 153-0 1.82-16 5.5-20 n11 2.5-04 .046 .046 3.0407 1100 4.44-0 .03 1.741 1.0499 153-0 4.99-17 2.71-20 p11 2.5-04 .046 .046 1.5+07 1100 9.04-0 .03 3.44-1 1.0499 153-0 4.39-17 1.35-20 n11 2.5-04 .046 .046 7.4+06 1100 9.04-0 .03 3.44-1 1.0499 153-0 4.39-17 1.35-20 n11 2.5-04 .046 .046 7.4+06 1100 3.74-11 .03 7.04-1 1.0827 153-0 2.16-17 6.50-21 p11 2.5-04 .047 .047 3.64-06 1100 3.74-11 .03 7.04-1 1.195 153-0 1.07-17 3.25-21 n11 2.5-04 .047 .047 3.64-06 1100 3.74-11 .03 1.44-1 1.195 153-0 1.07-17 3.25-21 n11 2.5-04 .047 .047 1.04-06 1100 3.74-11 .03 7.04-1 1.1483 153.0 5.33-16 1.61-21 n11 2.5-04 .047 .047 1.04-06 1100 3.74-11 .03 7.74-1 1.1483 153.0 2.66-10 A.03-22 n11 2.5-04 .047 .047 1.04-06 1100 3.04-11 .03 7.74-1 1.24-0 153.0 1.33-12 4.03-22 n11 2.5-04 .047 .047 1.04-06 1100 3.04-11 .03 7.74-1 1.24-0 153.0 1.33-12 4.03-22 n11 2.4-04 .040 .040 .040 1.14-05 1100 1.5-11 .03 7.74-1 1.24-0 153.0 1.33-12 4.03-22 n11 2.4-04 .040 .040 .040 1.14-05 1100 1.24-12 .03 9.3-14 1.24-0 1.35-0 1.74-10 5.1-2 2.6-2 11 2.4-04 .040 .040 .040 1.14-05 1100 1.24-12 .03 9.3-14 1.35-12 1.35-0 1.35-12 2.6-2 11 2.4-04 .040 .040 .040 1.14-05 1100 1.24-12 .03 9.3-14 1.35-12 1.35-0 1.35-12 2.6-2 11 2.4-04 .040 .040 .040 1.14-05 1100 1.24-12 .03 9.3-14 1.35-12 1.35-0 1.35-	.9515 153-0 3.74-16 1.13-19 01. 2.6-04 .046 6.2407 1100 2.24-09 .03 8.241 1.9643 153-0 1.82-16 5.5-20 n11 2.5-04 .046 .046 3.0407 1100 4.44-0 .03 1.741 1.0499 153-0 4.99-17 2.71-20 p11 2.5-04 .046 .046 1.5+07 1100 9.04-0 .03 3.44-1 1.0499 153-0 4.39-17 1.35-20 n11 2.5-04 .046 .046 7.4+06 1100 9.04-0 .03 3.44-1 1.0499 153-0 4.39-17 1.35-20 n11 2.5-04 .046 .046 7.4+06 1100 3.74-11 .03 7.04-1 1.0827 153-0 2.16-17 6.50-21 p11 2.5-04 .047 .047 3.64-06 1100 3.74-11 .03 7.04-1 1.195 153-0 1.07-17 3.25-21 n11 2.5-04 .047 .047 3.64-06 1100 3.74-11 .03 1.44-1 1.195 153-0 1.07-17 3.25-21 n11 2.5-04 .047 .047 1.04-06 1100 3.74-11 .03 7.04-1 1.1483 153.0 5.33-16 1.61-21 n11 2.5-04 .047 .047 1.04-06 1100 3.74-11 .03 7.74-1 1.1483 153.0 2.66-10 A.03-22 n11 2.5-04 .047 .047 1.04-06 1100 3.04-11 .03 7.74-1 1.24-0 153.0 1.33-12 4.03-22 n11 2.5-04 .047 .047 1.04-06 1100 3.04-11 .03 7.74-1 1.24-0 153.0 1.33-12 4.03-22 n11 2.4-04 .040 .040 .040 1.14-05 1100 1.5-11 .03 7.74-1 1.24-0 153.0 1.33-12 4.03-22 n11 2.4-04 .040 .040 .040 1.14-05 1100 1.24-12 .03 9.3-14 1.24-0 1.35-0 1.74-10 5.1-2 2.6-2 11 2.4-04 .040 .040 .040 1.14-05 1100 1.24-12 .03 9.3-14 1.35-12 1.35-0 1.35-12 2.6-2 11 2.4-04 .040 .040 .040 1.14-05 1100 1.24-12 .03 9.3-14 1.35-12 1.35-0 1.35-12 2.6-2 11 2.4-04 .040 .040 .040 1.14-05 1100 1.24-12 .03 9.3-14 1.35-12 1.35-0 1.35-													
9843 153-0 1-82-16 5-57-20 n11 2-5-04 046 046 3.5-07 1100 4.4-06 0.3 1.7-11 1.0017 153-0 4.92-17 2.71-20 n11 2.5-04 046 046 7.5-07 1100 9.0-09 9.3 3.4-11 1.0027 153-0 2.16-17 6.5-22 n11 2.5-04 047 047 3.4-16 1100 3.7-11 0.3 7.0-11 1.10827 153-0 2.16-17 5.5-22 n11 2.5-04 047 047 3.6-16 1100 3.7-11 0.3 7.0-11 1.10827 1.5-10 0.5 0.5-21 n11 2.5-04 047 047 0.4-16 1100 3.7-11 0.3 7.0-11 1.1083 153-0 5-33-16 1.6-21 n11 2.5-04 047 047 0.4-16 1100 3.7-11 0.3 7.0-11 1.1082 1.5-10 0.5 0.4-16 1.5-11 0.3 7.5-11 0.3 7.0-11 1.1082 1.5-0 0.2-16 0.4-17 0.4-17 0.4-17	9843 153-0 1-82-16 5-57-20 n11 2-5-04 046 046 3.5-07 1100 4.4-06 0.3 1.7-11 1.0017 153-0 4.92-17 2.71-20 n11 2.5-04 046 046 7.5-07 1100 9.0-09 9.3 3.4-11 1.0027 153-0 2.16-17 6.5-22 n11 2.5-04 047 047 3.4-16 1100 3.7-11 0.3 7.0-11 1.10827 153-0 2.16-17 5.5-22 n11 2.5-04 047 047 3.6-16 1100 3.7-11 0.3 7.0-11 1.10827 1.5-10 0.5 0.5-21 n11 2.5-04 047 047 0.4-16 1100 3.7-11 0.3 7.0-11 1.1083 153-0 5-33-16 1.6-21 n11 2.5-04 047 047 0.4-16 1100 3.7-11 0.3 7.0-11 1.1082 1.5-10 0.5 0.4-16 1.5-11 0.3 7.5-11 0.3 7.0-11 1.1082 1.5-0 0.2-16 0.4-17 0.4-17 0.4-17													
1.0171 153-0 8.92-17 2.71-20 P11. 2.5-04 .046 .046 1.5+07 1100 9.0100 9.3 3.441 1.0499 153-0 4.39-17 1.33-20 0.11 2.5-04 .046 .046 7.3+06 1100 3.7+11 .03 7.0+1 1.0827 153-0 2.16-17 6.50-21 P11. 2.5-04 .047 .047 .047 1.0406 1100 3.7+11 .03 7.0+1 .1155 153-0 1.07-17 3.25-21 0.11 2.5-04 .047 .047 1.0406 1100 3.7+11 .03 7.0+1 .14483 153-0 5.33-16 1.61-21 0.11 2.5-04 .047 .047 1.0406 1.05	1.0171 153-0 8.92-17 2.71-20 P11. 2.5-04 .046 .046 1.5+07 1100 9.0100 9.3 3.441 1.0499 153-0 4.39-17 1.33-20 0.11 2.5-04 .046 .046 7.3+06 1100 3.7+11 .03 7.0+1 1.0827 153-0 2.16-17 6.50-21 P11. 2.5-04 .047 .047 .047 1.0406 1100 3.7+11 .03 7.0+1 .1155 153-0 1.07-17 3.25-21 0.11 2.5-04 .047 .047 1.0406 1100 3.7+11 .03 7.0+1 .14483 153-0 5.33-16 1.61-21 0.11 2.5-04 .047 .047 1.0406 1.05	•9843	153.0	1.82-16	5.53-20	P11.	2.5-04		.046					
1.0899 153.0 4.39-17 1.33-20 A11. 2.5-04 .046 .046 7.4+06 1100. 1.4+10 .03 7.4+11 1.0827 155.0 2.66-17 6.55-21 A11. 2.5-04 .047 .047 1.4+06 1100. 7.5+10 .03 2.6-11 1.1155 153.0 1.07-17 3.25-21 A11. 2.5-04 .047 .047 1.4+06 1100. 7.5+10 .03 2.6-11 1.1483 153.0 5.33-16 1.61-21 A11. 2.5-04 .047 .047 4.4+06 1100. 3.7+11 1.1812 153.0 2.66-11 A.05-22 A11. 2.5-04 .047 .047 4.4+06 1100. 3.0+11 .03 7.7+11 1.1812 153.0 1.33-12 4.03-22 A11. 2.4-04 .049 .049 2.2+06 1100. 6.1+11 .93 1.2+14 1.2406 153.0 6.99-10 2.03-22 A11. 2.4-04 .049 .049 .049 1.1+05 1100. 6.1+11 .93 2.3+14 1.2496 153.0 1.71-16 5.16-23 A11. 2.4-04 .049 .049 .049 1.1+05 1100. 6.1+11 .93 9.3+14 1.2496 153.0 8.68-20 2.63-23 A11. 2.4-04 .049 .049 .049 2.4-04 1100. 4.7+12 .03 9.1+14 1.3526 153.0 8.68-20 2.63-23 A11. 2.4-04 .049 .049 2.4-04 1100. 4.7+12 .03 9.1+14 1.3526 153.0 8.68-20 2.63-23 A11. 2.4-04 .049 .049 2.4-04 1100. 9.3+12 .93 3.5+14 1.4936 153.0 1.61-21 3.5-24 A11. 2.4-04 .049 .049 .049 1.4-04 1100. 9.3+12 .93 3.5+14 1.49436 153.0 3.3-2-2 .03-2-2 A11. 2.4-04 .049 .049 .049 1.4-04 1100. 9.3+12 .93 3.5+14 1.49436 153.0 3.5-2-2 A11. 2.4-04 .049 .049 .049 1.4-04 1100. 9.3+12 .93 3.5+14 1.49436 153.0 3.5-2-2 A11. 2.4-04 .049 .049 .049 1.4-04 1100. 9.3+12 .93 3.5+14 1.49436 153.0 3.5-2-2 A11. 2.4-04 .049 .049 .049 .049 1.4-04 1100. 9.3+12 .93 3.5+14 1.49436 153.0 3.5-2-2 A11. 2.3-04 .049 .049 .049 .049 .049 1.4-04 1100 .9.3+12 .93 3.5+14 1.49436 153.0 3.5-2-2 A11. 2.3-04 .049 .049 .049 .049 .049 .049 .049 .0	1.0899 153.0 4.39-17 1.33-20 A11. 2.5-04 .046 .046 7.4+06 1100. 1.4+10 .03 7.4+11 1.0827 155.0 2.66-17 6.55-21 A11. 2.5-04 .047 .047 1.4+06 1100. 7.5+10 .03 2.6-11 1.1155 153.0 1.07-17 3.25-21 A11. 2.5-04 .047 .047 1.4+06 1100. 7.5+10 .03 2.6-11 1.1483 153.0 5.33-16 1.61-21 A11. 2.5-04 .047 .047 4.4+06 1100. 3.7+11 1.1812 153.0 2.66-11 A.05-22 A11. 2.5-04 .047 .047 4.4+06 1100. 3.0+11 .03 7.7+11 1.1812 153.0 1.33-12 4.03-22 A11. 2.4-04 .049 .049 2.2+06 1100. 6.1+11 .93 1.2+14 1.2406 153.0 6.99-10 2.03-22 A11. 2.4-04 .049 .049 .049 1.1+05 1100. 6.1+11 .93 2.3+14 1.2496 153.0 1.71-16 5.16-23 A11. 2.4-04 .049 .049 .049 1.1+05 1100. 6.1+11 .93 9.3+14 1.2496 153.0 8.68-20 2.63-23 A11. 2.4-04 .049 .049 .049 2.4-04 1100. 4.7+12 .03 9.1+14 1.3526 153.0 8.68-20 2.63-23 A11. 2.4-04 .049 .049 2.4-04 1100. 4.7+12 .03 9.1+14 1.3526 153.0 8.68-20 2.63-23 A11. 2.4-04 .049 .049 2.4-04 1100. 9.3+12 .93 3.5+14 1.4936 153.0 1.61-21 3.5-24 A11. 2.4-04 .049 .049 .049 1.4-04 1100. 9.3+12 .93 3.5+14 1.49436 153.0 3.3-2-2 .03-2-2 A11. 2.4-04 .049 .049 .049 1.4-04 1100. 9.3+12 .93 3.5+14 1.49436 153.0 3.5-2-2 A11. 2.4-04 .049 .049 .049 1.4-04 1100. 9.3+12 .93 3.5+14 1.49436 153.0 3.5-2-2 A11. 2.4-04 .049 .049 .049 1.4-04 1100. 9.3+12 .93 3.5+14 1.49436 153.0 3.5-2-2 A11. 2.4-04 .049 .049 .049 .049 1.4-04 1100. 9.3+12 .93 3.5+14 1.49436 153.0 3.5-2-2 A11. 2.3-04 .049 .049 .049 .049 .049 1.4-04 1100 .9.3+12 .93 3.5+14 1.49436 153.0 3.5-2-2 A11. 2.3-04 .049 .049 .049 .049 .049 .049 .049 .0	1.0171	153.0	8.92-17	2.71-20	P11.	2.5-04	.046						
1.0827 153.0 2.16-17 6.50-2 61 2.5-04 .047 .047 .047 3.6406 1100 3.7±10 .03 1.441 1.1155 153.0 1.07-17 3.25-2 011 2.5-04 .047 .047 3.6406 1100 7.5±10 .03 2.0±1 1.4483 153.0 2.66-11 8.61-2 011 2.5-04 .047 .047 4.406 1100 3.0±11 .03 5.7±1 1.2140 153.0 1.33-12 4.03-22 011 2.4-04 .047 .047 4.406 1100 5.1±11 .03 5.7±1 1.2468 153.0 6.69-19 2.03-22 011 2.4-04 .044 .044 .046 1.1±05 1100 1.2±12 .03 4.6±1 1.2796 153.0 3.7-10 1.09-22 011 2.4-04 .044 .046 5.6±04 1100 2.4±12 .03 9.1±1 1.3124 153.0 1.71-19 5.16-23 011 2.4-04 .044 .046 5.6±04 1100 2.4±12 .03 9.1±1 1.3780 153.0 2.26-22 6.61-23 011 2.4-04 .044 .046 1.4±04 1100 4.7±12 .03 3.5±1 1.3780 153.0 2.26-22 6.61-23 011 2.4-04 .046 .044 .046 1.4±04 1100 4.7±12 .03 3.5±1 1.4704 153.0 2.26-22 6.61-23 011 2.4-04 .046 .046 .044 1100 4.7±12 .03 3.5±1 1.4704 153.0 5.99-21 1.8-23 011 2.4-04 .046 .040 .046 .046 1.4±04 1100 3.4±12 .03 3.5±14 1.4704 153.0 5.99-22 1.8-2-24 011 2.4-04 .046 .046 .044 .140 .056	1.0827 153.0 2.16-17 6.50-2 61 2.5-04 .047 .047 .047 3.6406 1100 3.7±10 .03 1.441 1.1155 153.0 1.07-17 3.25-2 011 2.5-04 .047 .047 3.6406 1100 7.5±10 .03 2.0±1 1.4483 153.0 2.66-11 8.61-2 011 2.5-04 .047 .047 4.406 1100 3.0±11 .03 5.7±1 1.2140 153.0 1.33-12 4.03-22 011 2.4-04 .047 .047 4.406 1100 5.1±11 .03 5.7±1 1.2468 153.0 6.69-19 2.03-22 011 2.4-04 .044 .044 .046 1.1±05 1100 1.2±12 .03 4.6±1 1.2796 153.0 3.7-10 1.09-22 011 2.4-04 .044 .046 5.6±04 1100 2.4±12 .03 9.1±1 1.3124 153.0 1.71-19 5.16-23 011 2.4-04 .044 .046 5.6±04 1100 2.4±12 .03 9.1±1 1.3780 153.0 2.26-22 6.61-23 011 2.4-04 .044 .046 1.4±04 1100 4.7±12 .03 3.5±1 1.3780 153.0 2.26-22 6.61-23 011 2.4-04 .046 .044 .046 1.4±04 1100 4.7±12 .03 3.5±1 1.4704 153.0 2.26-22 6.61-23 011 2.4-04 .046 .046 .044 1100 4.7±12 .03 3.5±1 1.4704 153.0 5.99-21 1.8-23 011 2.4-04 .046 .040 .046 .046 1.4±04 1100 3.4±12 .03 3.5±14 1.4704 153.0 5.99-22 1.8-2-24 011 2.4-04 .046 .046 .044 .140 .056	1.0499	153.0	4.39-17	1.33-20	A11+	2.5-04	.046	.046					
1.1155 153.0 1.07-17 3.25-21 011. 2.5-04 .047 .047 .047 1.8406 1100. 7.5+10 .03 2.041 1.1483 153.0 5.33-16 1.61-21 011. 2.5-04 .047 .047 4.405 1100. 3.0+11 .03 5.7+11 1.1612 153.0 2.06-11 4.03-22 011. 2.5-04 .047 .047 4.405 1100. 3.0+11 .03 1.2+11 1.2140 153.0 1.33-12 4.03-22 011. 2.4-04 .048 .048 .048 .048 1100. 3.0+11 .03 2.3+11 1.2414 1.2400 153.0 1.33-12 4.03-22 011. 2.4-04 .048 .048 .048 1.1405 1100. 1.2+12 .03 4.6414 1.2796 153.0 3.37-10 1.02-22 011. 2.4-04 .048 .048 .048 1.1405 1100. 1.2+12 .03 4.6414 1.2124 153.0 1.71-10 5.16-23 011. 2.4-04 .048 .048 .048 5.6404 1100. 2.4+12 .03 4.6414 1.3124 153.0 1.71-10 5.16-23 011. 2.4-04 .048 .049 5.6404 1100. 4.7+12 .03 4.6414 1.34852 153.0 8.68-20 2.63-23 011. 2.4-04 .040 .040 .040 1.4404 1100. 4.7+12 .03 1.8+11 1.34852 153.0 8.68-20 2.63-23 011. 2.4-04 .040 .040 .040 7.4+04 1100. 4.7+12 .03 3.5+11 1.4108 153.0 2.26-22 6.36-24 011. 2.4-04 .040 .040 .040 7.4+03 1100. 1.8+13 .03 6.0+11 1.4408 153.0 2.26-22 6.36-24 011. 2.4-04 .040 .040 .040 7.4+03 1100. 1.8+13 .03 6.0+11 1.4406 153.0 1.16-20 3.5-24 011. 2.4-04 .040 .040 .040 7.4+03 1100. 1.8+13 .03 6.0+11 1.4406 153.0 5.09-21 1.82-24 011. 2.4-04 .040 .040 .040 7.4+03 1100. 1.8+13 .03 6.0+11 1.4406 153.0 5.09-21 1.82-24 011. 2.4-04 .040 .040 .040 7.4+03 1100. 1.8+13 .03 6.0+11 1.4406 153.0 5.09-21 1.82-24 011. 2.4-04 .040 .040 .040 7.4+03 1100. 1.8+14 .03 5.1+14 1.500	1.1155 153.0 1.07-17 3.25-21 011. 2.5-04 .047 .047 .047 1.8406 1100. 7.5+10 .03 2.041 1.1483 153.0 5.33-16 1.61-21 011. 2.5-04 .047 .047 4.405 1100. 3.0+11 .03 5.7+11 1.1612 153.0 2.06-11 4.03-22 011. 2.5-04 .047 .047 4.405 1100. 3.0+11 .03 1.2+11 1.2140 153.0 1.33-12 4.03-22 011. 2.4-04 .048 .048 .048 .048 1100. 3.0+11 .03 2.3+11 1.2414 1.2400 153.0 1.33-12 4.03-22 011. 2.4-04 .048 .048 .048 1.1405 1100. 1.2+12 .03 4.6414 1.2796 153.0 3.37-10 1.02-22 011. 2.4-04 .048 .048 .048 1.1405 1100. 1.2+12 .03 4.6414 1.2124 153.0 1.71-10 5.16-23 011. 2.4-04 .048 .048 .048 5.6404 1100. 2.4+12 .03 4.6414 1.3124 153.0 1.71-10 5.16-23 011. 2.4-04 .048 .049 5.6404 1100. 4.7+12 .03 4.6414 1.34852 153.0 8.68-20 2.63-23 011. 2.4-04 .040 .040 .040 1.4404 1100. 4.7+12 .03 1.8+11 1.34852 153.0 8.68-20 2.63-23 011. 2.4-04 .040 .040 .040 7.4+04 1100. 4.7+12 .03 3.5+11 1.4108 153.0 2.26-22 6.36-24 011. 2.4-04 .040 .040 .040 7.4+03 1100. 1.8+13 .03 6.0+11 1.4408 153.0 2.26-22 6.36-24 011. 2.4-04 .040 .040 .040 7.4+03 1100. 1.8+13 .03 6.0+11 1.4406 153.0 1.16-20 3.5-24 011. 2.4-04 .040 .040 .040 7.4+03 1100. 1.8+13 .03 6.0+11 1.4406 153.0 5.09-21 1.82-24 011. 2.4-04 .040 .040 .040 7.4+03 1100. 1.8+13 .03 6.0+11 1.4406 153.0 5.09-21 1.82-24 011. 2.4-04 .040 .040 .040 7.4+03 1100. 1.8+13 .03 6.0+11 1.4406 153.0 5.09-21 1.82-24 011. 2.4-04 .040 .040 .040 7.4+03 1100. 1.8+14 .03 5.1+14 1.500	1.0827	153.0	2 • 16 - 17	6.50-21	811.	2.5-04		.n47			3.7+10	.93	
1.4483 153.0 5.33-16 1.61-21 211. 2.5-04 0.07 .947 8.9405 1100. 1.5+11 .93 5.7+11 .1612 153.0 2.66-1P 8.05-22 211. 2.6-04 0.04 .048 .048 2.2405 1100. 6.1+11 .93 2.3411 .2140 153.0 1.33-12 4.03-22 211. 2.4-04 .048 .048 .049 2.2405 1100. 6.1+11 .93 9.3+11 .2796 153.0 3.37-10 1.02-22 211. 2.4-04 .048 .049 2.66-10 1100. 1.2+12 .93 9.3+11 .2796 153.0 3.37-10 1.02-22 211. 2.4-04 .048 .049 .049 2.4405 1100. 2.4+12 .93 9.1+11 .2796 153.0 3.37-10 1.02-22 211. 2.4-04 .048 .049 .049 2.4404 1100. 2.4+12 .93 9.1+11 .2796 153.0 8.68-20 2.65-23 211. 2.4-04 .048 .049 2.4404 1100. 4.7+12 .93 9.1+11 .2798 153.0 8.68-20 2.65-23 211. 2.4-04 .049 .049 .049 2.4404 1100. 4.7+12 .93 9.3+11 .2798 153.0 4.42-24 1.34-27 311. 2.4-04 .049 .049 .049 .0490 1.4404 1100. 4.7+12 .93 .5+11 .4404 1100. 4.7+12 .93 .5+11 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 4.4414 .4404	1.4483 153.0 5.33-16 1.61-21 211. 2.5-04 0.07 .947 8.9405 1100. 1.5+11 .93 5.7+11 .1612 153.0 2.66-1P 8.05-22 211. 2.6-04 0.04 .048 .048 2.2405 1100. 6.1+11 .93 2.3411 .2140 153.0 1.33-12 4.03-22 211. 2.4-04 .048 .048 .049 2.2405 1100. 6.1+11 .93 9.3+11 .2796 153.0 3.37-10 1.02-22 211. 2.4-04 .048 .049 2.66-10 1100. 1.2+12 .93 9.3+11 .2796 153.0 3.37-10 1.02-22 211. 2.4-04 .048 .049 .049 2.4405 1100. 2.4+12 .93 9.1+11 .2796 153.0 3.37-10 1.02-22 211. 2.4-04 .048 .049 .049 2.4404 1100. 2.4+12 .93 9.1+11 .2796 153.0 8.68-20 2.65-23 211. 2.4-04 .048 .049 2.4404 1100. 4.7+12 .93 9.1+11 .2798 153.0 8.68-20 2.65-23 211. 2.4-04 .049 .049 .049 2.4404 1100. 4.7+12 .93 9.3+11 .2798 153.0 4.42-24 1.34-27 311. 2.4-04 .049 .049 .049 .0490 1.4404 1100. 4.7+12 .93 .5+11 .4404 1100. 4.7+12 .93 .5+11 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 6.441 .4404 1100. 4.4413 .93 4.4414 .4404	1.1155	153.0	1.07-17	3.25-21	911.	2.5-04	.047	· N47				•93	
1.8182 153.0 2.66-1P 8.05-22 211 2.8-04 .047 .048 2.2455 110.0 6.111 .93 .9311 .2468 153.0 6.69-12 2.03-22 .011 2.4-04 .044 .044 .044 .105 110.0 1.211 .93 .9311 .2468 153.0 3.37-10 1.02-22 .011 2.4-04 .044 .044 .044 .105 110.0 1.211 .93 .9311 .24-04 .044 .044 .044 .044 .105 110.0 .2411 .93 .9311 .24-04 .044 .044 .044 .044 .044 .106 .1411 .93 .9311 .13124 .153.0 1.71-19 5.16-23 .111 2.4-04 .044	1.8182 153.0 2.66-1P 8.05-22 211 2.8-04 .047 .048 2.2455 110.0 6.111 .93 .9311 .2468 153.0 6.69-12 2.03-22 .011 2.4-04 .044 .044 .044 .105 110.0 1.211 .93 .9311 .2468 153.0 3.37-10 1.02-22 .011 2.4-04 .044 .044 .044 .105 110.0 1.211 .93 .9311 .24-04 .044 .044 .044 .044 .105 110.0 .2411 .93 .9311 .24-04 .044 .044 .044 .044 .044 .106 .1411 .93 .9311 .13124 .153.0 1.71-19 5.16-23 .111 2.4-04 .044	1.1483	153.0	5.33-18	1.61-21	n11•	2.5-04	.047	• 247					
1.2668 153.0 6.66-10 2.03-22 011 2.40-04 .040 .040 1.1+05 1100 1.2+12 .033 4.6+14 1.2796 153.0 3.37-10 1.02-22 011 2.40-04 .040 .040 5.6+04 1100 1.2+12 .033 9.1+14 1.3124 153.0 1.71-10 5.16-23 011 2.40-04 .040 .040 .040 7.40-1100 9.3+12 .033 9.1+14 1.3352 153.0 8.68-20 2.63-23 011 2.40-04 .040 .040 1.4104 1100 9.3+12 .033 3.5+14 1.3380 153.0 4.49-20 1.34-23 011 2.40-04 .040 .040 .040 7.40-1100 9.3+12 .033 3.5+14 1.3380 153.0 2.26-20 6.86-24 011 2.40-04 .040 .040 7.40-1100 1.0+13 .03 6.0+13 .03 1.44-16 1.340 153.0 2.26-20 6.86-24 011 2.40-04 .040 .040 7.40-1100 6.4-13 .03 1.44-16 1.340 153.0 1.16-20 3.52-20 011 2.40-04 .040 .050 7.80-13 1100 5.6-13 .03 1.44-16 153.0 5.99-21 1.82-20 011 2.30-04 .050 .050 1.04-3 1100 1.3+14 .03 5.1+14 1.5093 153.0 3.10-21 9.30-25 011 2.30-04 .050 .050 1.60-21 1.02-20 011 2.30-04 .050 .050 5.24-20 1100 2.6+14 .03 0.94-16 1.5503 153.0 3.10-21 9.30-25 011 2.30-04 .050 .050 5.24-20 1100 2.6+14 .03 0.94-16 1.5503 153.0 8.77-22 2.54-25 011 2.2-04 .050 .050 .050 5.24-20 1100 2.6+14 .03 0.94-16 1.5503 153.0 8.77-22 2.54-25 011 2.2-04 .050 .050 .050 1.40-3 1100 1.6+14 .03 3.74-17 1.6077 153.0 8.77-22 2.54-25 011 2.2-04 .050 .050 .050 1.40-3 1100 1.6+14 .03 3.74-17 1.6007 153.0 8.77-22 2.54-25 011 2.2-04 .050 .050 .050 1.40-3 1100 1.6+15 .03 7.0+17 1.6007 153.0 8.77-22 1.33-25 011 2.3-04 .050 .050 1.40-3 1100 1.6+15 .03 7.0+17 1.6007 153.0 9.59-24 2.80-27 011 2.2-04 .050 .050 1.500 1.40-3 1100 1.6+15 .03 7.0+17 1.6007 153.0 8.77-22 1.33-25 011 2.7-04 .050 .050 1.500 1.40-3 1100 1.6+15 .03 7.0+17 1.6007 153.0 8.77-22 1.33-25 011 2.7-04 .050 .050 1.6+10 1100 .000 1.6+1	1.2668 153.0 6.66-10 2.03-22 011 2.40-04 .040 .040 1.1+05 1100 1.2+12 .033 4.6+14 1.2796 153.0 3.37-10 1.02-22 011 2.40-04 .040 .040 5.6+04 1100 1.2+12 .033 9.1+14 1.3124 153.0 1.71-10 5.16-23 011 2.40-04 .040 .040 .040 7.40-1100 9.3+12 .033 9.1+14 1.3352 153.0 8.68-20 2.63-23 011 2.40-04 .040 .040 1.4104 1100 9.3+12 .033 3.5+14 1.3380 153.0 4.49-20 1.34-23 011 2.40-04 .040 .040 .040 7.40-1100 9.3+12 .033 3.5+14 1.3380 153.0 2.26-20 6.86-24 011 2.40-04 .040 .040 7.40-1100 1.0+13 .03 6.0+13 .03 1.44-16 1.340 153.0 2.26-20 6.86-24 011 2.40-04 .040 .040 7.40-1100 6.4-13 .03 1.44-16 1.340 153.0 1.16-20 3.52-20 011 2.40-04 .040 .050 7.80-13 1100 5.6-13 .03 1.44-16 153.0 5.99-21 1.82-20 011 2.30-04 .050 .050 1.04-3 1100 1.3+14 .03 5.1+14 1.5093 153.0 3.10-21 9.30-25 011 2.30-04 .050 .050 1.60-21 1.02-20 011 2.30-04 .050 .050 5.24-20 1100 2.6+14 .03 0.94-16 1.5503 153.0 3.10-21 9.30-25 011 2.30-04 .050 .050 5.24-20 1100 2.6+14 .03 0.94-16 1.5503 153.0 8.77-22 2.54-25 011 2.2-04 .050 .050 .050 5.24-20 1100 2.6+14 .03 0.94-16 1.5503 153.0 8.77-22 2.54-25 011 2.2-04 .050 .050 .050 1.40-3 1100 1.6+14 .03 3.74-17 1.6077 153.0 8.77-22 2.54-25 011 2.2-04 .050 .050 .050 1.40-3 1100 1.6+14 .03 3.74-17 1.6007 153.0 8.77-22 2.54-25 011 2.2-04 .050 .050 .050 1.40-3 1100 1.6+15 .03 7.0+17 1.6007 153.0 8.77-22 1.33-25 011 2.3-04 .050 .050 1.40-3 1100 1.6+15 .03 7.0+17 1.6007 153.0 9.59-24 2.80-27 011 2.2-04 .050 .050 1.500 1.40-3 1100 1.6+15 .03 7.0+17 1.6007 153.0 8.77-22 1.33-25 011 2.7-04 .050 .050 1.500 1.40-3 1100 1.6+15 .03 7.0+17 1.6007 153.0 8.77-22 1.33-25 011 2.7-04 .050 .050 1.6+10 1100 .000 1.6+1		153.0			211.	2.5-04	.047	.047					
1.2796 153.0 3.37-10 1.02-20 011 2.4-04 040 040 5.6+04 1100 2.4+12 03 9.1+14 1.3124 153.0 1.71-10 5.16-23 011 2.4-04 040 040 0.040 2.6+04 1100 4.7+12 03 1.8+14 1.3452 153.0 8.68-20 2.63-23 011 2.4-04 040 040 040 040 7.4+03 1100 1.8+13 03 3.5+13 1.3780 153.0 4.42-20 1.34-23 011 2.4-04 040 040 040 7.4+03 1100 1.8+13 03 6.0+14 1.4436 153.0 2.26-26 6.86-24 011 2.4-04 040 040 040 040 040 040 040 040 040	1.2796 153.0 3.37-10 1.02-20 011 2.4-04 040 040 5.6+04 1100 2.4+12 03 9.1+14 1.3124 153.0 1.71-10 5.16-23 011 2.4-04 040 040 0.040 2.6+04 1100 4.7+12 03 1.8+14 1.3452 153.0 8.68-20 2.63-23 011 2.4-04 040 040 040 040 7.4+03 1100 1.8+13 03 3.5+13 1.3780 153.0 4.42-20 1.34-23 011 2.4-04 040 040 040 7.4+03 1100 1.8+13 03 6.0+14 1.4436 153.0 2.26-26 6.86-24 011 2.4-04 040 040 040 040 040 040 040 040 040		153.0			211.	2.4-04	•048	•04P	2.2+05	.110n•	6.1+11	- •93	2.3+10
1.3124 153.0 1.71-19 5.16-27 211. 2.4-04 .044 .049 2.8+04 1100. 4.7+12 .93 1.8+12 1.3452 153.0 8.68-29 2.63-23 211. 2.4-04 .040 .040 1.4949 1100. 9.3+12 .93 3.5+14 1.3780 153.0 4.49-26 1.34-27 311. 2.4-04 .040 .040 7.4947 1100. .0413 .93 6.941 1.4108 153.0 2.26-22 6.86-24 211. 2.4-04 .040 .040 .040 7.4947 1100. 3.64-13 .93 1.4416 153.0 1.16-20 3.52-24 211. 2.4-04 .040 .040 .040 .040 .040 1.9407 1100. 6.4413 .93 1.4416 1.4764 153.0 5.99-21 1.82-24 211. 2.7-04 .050 .050 1.01403 1100. 1.3414 .93 5.446 1.5942 153.0 3.10-21 9.30-25 211. 2.3-04 .050 .050 1.01403 1100. 1.3414 .93 5.446 1.5942 153.0 3.10-21 9.30-25 211. 2.3-04 .050 .050 1.01403 1100. 1.3414 .93 5.446 1.5942 153.0 3.70-22 2.4-25 211. 2.3-04 .050 .050 1.01403 1100. 2.6414 .93 0.9416 1.5749 153.0 8.57-22 2.54-25 211. 2.3-04 .050 .050 .050 1.4040 1100. 9.6414 .93 3.7416 1.5077 153.0 8.57-22 1.32-25 211. 2.2-04 .050 .050 .050 1.4040 1100. 9.6414 .93 3.7416 1.6077 153.0 8.57-22 1.32-25 211. 2.2-04 .050 .050 .050 1.4040 1100. 9.6414 .93 3.7416 1.605 153.0 2.29-22 6.65-26 211. 2.2-04 .050 .050 .050 1.4040 1100. 3.5415 .93 3.7416 1.8045 153.0 2.29-22 6.65-26 211. 2.2-04 .050 .050 .050 1.4040 1100. 3.5415 .03 3.7416 1.8045 153.0 2.29-22 6.65-26 211. 2.2-04 .050 .050 .050 1.4040 1100. 3.5415 .03 3.7416 1.8045 153.0 2.29-27 6.65-26 211. 2.2-04 .050 .050 .050 1.4040 1100. 3.5415 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.74	1.3124 153.0 1.71-19 5.16-27 211. 2.4-04 .044 .049 2.8+04 1100. 4.7+12 .93 1.8+12 1.3452 153.0 8.68-29 2.63-23 211. 2.4-04 .040 .040 1.4949 1100. 9.3+12 .93 3.5+14 1.3780 153.0 4.49-26 1.34-27 311. 2.4-04 .040 .040 7.4947 1100. .0413 .93 6.941 1.4108 153.0 2.26-22 6.86-24 211. 2.4-04 .040 .040 .040 7.4947 1100. 3.64-13 .93 1.4416 153.0 1.16-20 3.52-24 211. 2.4-04 .040 .040 .040 .040 .040 1.9407 1100. 6.4413 .93 1.4416 1.4764 153.0 5.99-21 1.82-24 211. 2.7-04 .050 .050 1.01403 1100. 1.3414 .93 5.446 1.5942 153.0 3.10-21 9.30-25 211. 2.3-04 .050 .050 1.01403 1100. 1.3414 .93 5.446 1.5942 153.0 3.10-21 9.30-25 211. 2.3-04 .050 .050 1.01403 1100. 1.3414 .93 5.446 1.5942 153.0 3.70-22 2.4-25 211. 2.3-04 .050 .050 1.01403 1100. 2.6414 .93 0.9416 1.5749 153.0 8.57-22 2.54-25 211. 2.3-04 .050 .050 .050 1.4040 1100. 9.6414 .93 3.7416 1.5077 153.0 8.57-22 1.32-25 211. 2.2-04 .050 .050 .050 1.4040 1100. 9.6414 .93 3.7416 1.6077 153.0 8.57-22 1.32-25 211. 2.2-04 .050 .050 .050 1.4040 1100. 9.6414 .93 3.7416 1.605 153.0 2.29-22 6.65-26 211. 2.2-04 .050 .050 .050 1.4040 1100. 3.5415 .93 3.7416 1.8045 153.0 2.29-22 6.65-26 211. 2.2-04 .050 .050 .050 1.4040 1100. 3.5415 .03 3.7416 1.8045 153.0 2.29-22 6.65-26 211. 2.2-04 .050 .050 .050 1.4040 1100. 3.5415 .03 3.7416 1.8045 153.0 2.29-27 6.65-26 211. 2.2-04 .050 .050 .050 1.4040 1100. 3.5415 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.7416 .03 3.74					n11•		•040	• A4 B	1.1+05	1100-	1.2+12	.93	4.6+1
1.3452 153.0 8.68-20 2.63-27 c11. 2.4-04 .040 .040 1.4.04 1100. 9.3+12 .93 3.5+14 1.3780 153.0 4.42-20 1.34-27 s11. 2.4-04 .040 .040 7.4.4-3 1100. 1.4+13 .93 6.0+14 1.4108 153.0 2.65-26 6.95-24 c11. 2.4-04 .040 .040 .040 7.4.4-3 1100. 3.5+13 .93 1.4+14 1.408 153.0 2.65-26 .056-24 c11. 2.4-04 .040 .040 .040 1.4.4-3 1100. 6.0+13 .93 2.65+14 1.4764 153.0 5.0-921 1.26-20 .011. 2.4-04 .040 .040 .040 1.940 1100. 6.0+13 .93 2.65+14 1.5503 153.0 3.10-21 9.33-26 .011. 2.7-04 .050 .050 1.0+03 1100. 1.3+14 .93 2.65+14 1.5503 153.0 3.10-21 9.33-26 .011. 2.3-04 .050 .050 1.0+03 1100. 2.6+14 .03 0.0+1 1.5749 153.0 8.37-22 2.54-25 .011. 2.3-04 .050 .050 .050 1.0+03 1100. 5.9+14 .93 1.9+17 1.5749 153.0 8.37-22 2.54-25 .011. 2.3-04 .050 .050 .050 1.4-10 .50 .50 .050 1.4-10 .50 .050 1.4-10 .50 .050 1.4-10 .50 .050 1.4-10 .50 .50 .050 1.4-10 .50 .50 .50 .050 1.4-10 .50 .50 .50 .50 .50 .50 .50 .50 .50 .5	1.3452 153.0 8.68-20 2.63-27 c11. 2.4-04 .040 .040 1.4.04 1100. 9.3+12 .93 3.5+14 1.3780 153.0 4.42-20 1.34-27 s11. 2.4-04 .040 .040 7.4.4-3 1100. 1.4+13 .93 6.0+14 1.4108 153.0 2.65-26 6.95-24 c11. 2.4-04 .040 .040 .040 7.4.4-3 1100. 3.5+13 .93 1.4+14 1.408 153.0 2.65-26 .056-24 c11. 2.4-04 .040 .040 .040 1.4.4-3 1100. 6.0+13 .93 2.65+14 1.4764 153.0 5.0-921 1.26-20 .011. 2.4-04 .040 .040 .040 1.940 1100. 6.0+13 .93 2.65+14 1.5093 153.0 3.10-21 9.30-26 .011. 2.3-04 .050 .050 1.0+03 1100. 1.3+14 .93 2.65+14 1.5593 153.0 3.10-21 9.30-26 .011. 2.3-04 .050 .050 1.0+03 1100. 2.6+14 .03 0.0+1 1.5749 153.0 8.37-22 2.54-25 .011. 2.3-04 .050 .050 .050 1.0+03 1100. 5.9+14 .93 1.9+1 1.5749 153.0 8.37-22 2.54-25 .011. 2.3-04 .050 .050 .050 1.4-10 .509 .050 1.4-10 .509 1100. 5.9+14 .93 1.9+1 1.6007 153.0 2.29-22 6.00-26 .011. 2.3-04 .050 .050 .050 1.4-10 .00 .00 .00 .00 .00 .00 .00 .00 .00 .								• 040	5.6+04	11100	2.4+12	. •93	9.1+1
1.5780 155.0 4.42-20 1.34-21 41. 2.4-04 .040 .040 .040 .040 .040 .040 .040	1.5780 155.0 4.42-20 1.34-21 41. 2.4-04 .040 .040 .040 .040 .040 .040 .040									2 - 2+04	1100.	4.7+12	-93	1.8+1
1.4108 153.0 2.26-20 6.86-24 c11. 2.4-04 .049 .040 2.46-3 1100. 3.6+13 .93 1.4+16 1.4436 153.0 1.16-20 3.52-26 .011. 2.4-04 .040 .040 .040 1.9+3 1100. 6.4+13 .93 2.6+16 1.4764 153.0 5.99-21 1.62-24 .011. 2.7-04 .050 .050 1.9+3 1100. 1.3+14 .93 5.1+16 1.5093 153.0 3.10-21 9.30-25 .011. 2.3-04 .050 .050 5.2+02 1100. 2.6+14 .03 0.9+16 1.5942 153.0 1.61-21 4.37-25 .011. 2.3-04 .050 .050 .550 5.2+02 1100. 2.6+14 .03 0.9+16 1.5749 153.0 8.37-22 2.54-25 .011. 2.3-04 .050 .050 .050 1.9+3 1100. 1.8+15 .03 3.7-16 1.6077 153.0 4.37-22 1.32-25 .011. 2.3-04 .050 .050 .050 1.9+3 1100. 9.6+14 .03 3.7-16 1.6077 153.0 4.37-22 1.32-25 .011. 2.3-04 .050 .050 .050 1.9+3 1100. 1.8+15 .03 7.0+17 1.60405 153.0 9.52-24 2.80-27 .011. 2.2-04 .051 .051 .051 3.8+01 1100. 1.8+15 .03 7.0+17 1.80405 153.0 9.52-24 2.80-27 .011. 2.2-04 .052 .052 1.6+00 1100. 8.5+16 .03 3.2+16 1.80405 153.0 4.29-25 1.35-27 .011. 2.2-04 .052 .052 1.6+00 1100. 8.5+16 .03 3.2+16 1.80405 153.0 9.52-24 2.80-27 .011. 2.2-04 .052 .052 1.6+00 1100. 8.5+16 .03 3.2+16 1.80405 153.0 1.09-27 3.31-31 .011. 2.1-04 .055 .055 1.6+00 1100. 7.4+00 .03 3.2+16 2.1326 153.0 2.02-26 6.35-30 .011. 2.1-04 .055 .055 1.6+00 1100. 7.4+00 .03 1.5+12 2.1326 153.0 3.00-26 6.35-30 .011. 2.1-04 .055 .055 1.6-05 1100. 7.4+00 .03 1.5+12 2.4607 153.0 1.09-27 3.31-31 .011. 2.1-04 .055 .055 1.0-05 1100. 1.3+12 .03 2.8+12 2.4607 153.0 3.70-30 1.12-33 .011. 2.0-04 .050 .050 6.1-07 1100. 2.2+23 .03 8.3+24 2.6288 153.0 2.38-33 7.21-35 .011. 2.0-04 .050 .050 6.1-07 1100. 2.2+23 .03 8.3+24 2.6288 153.0 2.38-33 7.21-35 .011. 2.0-04 .060 .050 .050 6.1-07 1100. 4.0+25 .03 1.9+2 2.7888 153.0 2.38-33 7.21-35 .011. 2.0-04 .060 .060 .050 2.7-00 1100. 4.0+25 .03 1.9+2 2.7888 153.0 2.38-33 7.21-35 .011. 2.0-04 .060 .060 2.7-00 1100. 4.0+25 .03 1.9+2 2.7889 153.0 1.63-33 4.91-35 .011. 1.0-04 .060 .060 2.7-00 1100. 4.0+25 .03 1.9+2 2.7889 153.0 1.0-33 3.61-37 .011. 1.0-04 .060 .060 2.7-00 1100. 4.0+25 .03 1.9+2 2.7889 153.0 1.0-33 3.61-37 .011. 1.0-04 .060 .060 2.7-00 1100. 4.0+25 .03 1.9+2 2.7899 153.0 1.0-33 3.6	1.4108 153.0 2.26-20 6.86-24 c11. 2.4-04 .049 .040 2.46-3 1100. 3.6+13 .93 1.4+16 1.4436 153.0 1.16-20 3.52-26 .011. 2.4-04 .040 .040 .040 1.9+3 1100. 6.4+13 .93 2.6+16 1.4764 153.0 5.99-21 1.62-24 .011. 2.7-04 .050 .050 1.9+3 1100. 1.3+14 .93 5.1+16 1.5093 153.0 3.10-21 9.30-25 .011. 2.3-04 .050 .050 5.2+02 1100. 2.6+14 .03 0.9+16 1.5942 153.0 1.61-21 4.37-25 .011. 2.3-04 .050 .050 .550 5.2+02 1100. 2.6+14 .03 0.9+16 1.5749 153.0 8.37-22 2.54-25 .011. 2.3-04 .050 .050 .050 1.9+3 1100. 1.8+15 .03 3.7-16 1.6077 153.0 4.37-22 1.32-25 .011. 2.3-04 .050 .050 .050 1.9+3 1100. 9.6+14 .03 3.7-16 1.6077 153.0 4.37-22 1.32-25 .011. 2.3-04 .050 .050 .050 1.9+3 1100. 1.8+15 .03 7.0+17 1.60405 153.0 9.52-24 2.80-27 .011. 2.2-04 .051 .051 .051 3.8+01 1100. 1.8+15 .03 7.0+17 1.80405 153.0 9.52-24 2.80-27 .011. 2.2-04 .052 .052 1.6+00 1100. 8.5+16 .03 3.2+16 1.80405 153.0 4.29-25 1.35-27 .011. 2.2-04 .052 .052 1.6+00 1100. 8.5+16 .03 3.2+16 1.80405 153.0 9.52-24 2.80-27 .011. 2.2-04 .052 .052 1.6+00 1100. 8.5+16 .03 3.2+16 1.80405 153.0 1.09-27 3.31-31 .011. 2.1-04 .055 .055 1.6+00 1100. 7.4+00 .03 3.2+16 2.1326 153.0 2.02-26 6.35-30 .011. 2.1-04 .055 .055 1.6+00 1100. 7.4+00 .03 1.5+12 2.1326 153.0 3.00-26 6.35-30 .011. 2.1-04 .055 .055 1.6-05 1100. 7.4+00 .03 1.5+12 2.4607 153.0 1.09-27 3.31-31 .011. 2.1-04 .055 .055 1.0-05 1100. 1.3+12 .03 2.8+12 2.4607 153.0 3.70-30 1.12-33 .011. 2.0-04 .050 .050 6.1-07 1100. 2.2+23 .03 8.3+24 2.6288 153.0 2.38-33 7.21-35 .011. 2.0-04 .050 .050 6.1-07 1100. 2.2+23 .03 8.3+24 2.6288 153.0 2.38-33 7.21-35 .011. 2.0-04 .060 .050 .050 6.1-07 1100. 4.0+25 .03 1.9+2 2.7888 153.0 2.38-33 7.21-35 .011. 2.0-04 .060 .060 .050 2.7-00 1100. 4.0+25 .03 1.9+2 2.7888 153.0 2.38-33 7.21-35 .011. 2.0-04 .060 .060 2.7-00 1100. 4.0+25 .03 1.9+2 2.7889 153.0 1.63-33 4.91-35 .011. 1.0-04 .060 .060 2.7-00 1100. 4.0+25 .03 1.9+2 2.7889 153.0 1.0-33 3.61-37 .011. 1.0-04 .060 .060 2.7-00 1100. 4.0+25 .03 1.9+2 2.7889 153.0 1.0-33 3.61-37 .011. 1.0-04 .060 .060 2.7-00 1100. 4.0+25 .03 1.9+2 2.7899 153.0 1.0-33 3.6									1.4.04	1100.	9.3+12	. •93	3.5+15
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2.7888 153.0 2.38-3: 7.21-35 011 1.0-04 .061 .061 4.0-08 1100 3.4+24 .03 1.3+2 2.9529 153.0 1.63-30 4.91-36 011 1.0-04 .060 .060 2.7-00 1100 4.0+25 .03 1.9+2 3.1169 153.0 1.19-33 3.61-37 011 1.0-04 .067 .067 2.0-10 1100 6.2+26 .93 2.6+2	2.7888 153.0 2.38-3: 7.21-35 011 1.0-04 .061 .061 4.0-08 1100 3.4+24 .03 1.3+2 2.9529 153.0 1.63-30 4.91-36 011 1.0-04 .060 .060 2.7-00 1100 4.0+25 .03 1.9+2 3.1169 153.0 1.19-33 3.61-37 011 1.0-04 .067 .067 2.0-10 1100 6.2+26 .93 2.6+2													
2.9529 153.0 1.63-37 4.91-35 7.11. 1.0-04 .067 2.7-00 1100. 4.0425 .03 1.942 3.1169 153.0 1.19-33 3.61-37 911. 1.0-04 .067 .063 2.0-10 1100. 6.2+26 .93 2.6+2	2.9529 153.0 1.63-37 4.91-35 7.11. 1.0-04 .067 2.7-00 1100. 4.0425 .03 1.942 3.1169 153.0 1.19-33 3.61-37 911. 1.0-04 .067 .063 2.0-10 1100. 6.2+26 .93 2.6+2													
3.1169 153.0 1.19-33 3.61-37 cii. 1.0-04 .067 .067 2.0-10 1100. 6.2+26 .93 2.6+20	3.1169 153.0 1.19-33 3.61-37 cii. 1.0-04 .067 .067 2.0-10 1100. 6.2+26 .93 2.6+20													
							1.0-04							
COLUMNAR MASS = .ESO SECIO/SC FT PENNETMON FAMIL'S = 2009.6 MILES	COLUMNAR VASS = .ESA SELVICI/SE FT PENNETTONY FACTO'S = 2009.6 MILES													
		(COLUMNAR	*ASS = .8	sk SLUG/Sr I	FT .	PL/NET^Q	Y FANTÜS	= 2000	יל א ו ורכ				_
										-				

TABLE IV. - MODEL ATMOSPHERE FOR EARTH

	-												
					MODEL ATM	OSPHFRE	FOR FARTH				U•5•196	2	
CONSTRU	JCTION F	PARAMETERS			, eci	ENTIFIC	UNITS					ATE 9/20/6	5 7
	PRESSI EXOSPI		13•25 №9 00•00(KM)		RFACE TEMP LECULAR WE		= 288 • 15 28 • 96			DENSIT		22-03 GM/0	
	OF EAR		78.40 (KM)		RCENT NITE		78 • 08			NT COS		_CM/SEC/SE 030	<u>-</u> C
PERCENT			20.950		RCENT ARGO		•93	0	PERCE	NT NEON	_=	000	
PERCENT PERCENT	T HYDROG	3EN =	•000		RCENT HELI RCENT SO2	UM =	•00 •00		PERCE	NT WATER	₹ = •	000	
TENTEN					HOLINI SOZ		• 0 (/	<u> </u>					
	TEMPE	RATURE AND	MOLECULAR	WETGUT DY	STRURTON								
		THE AND		neroni bi	311.2001201	•							
	AT	11.00	GEOP KM		ERATURE=		65 K			WE I GHT=		40	-
	AT	20.00	GEOP KM		FRATURF=		65 K		LECULAR	WEIGHT=			
	AT	32 • 00 47 • 00	GEOP KM		FRATURF= FRATURF=		65 K		LECILAR	WF I GHT=			
	- ŤĀ	52.00	GEOP KM		ERATURE =		65 K		LECHLAR	WEIGHT=			
	AT	61.00	GFOP KM		FPATURF=		65 K			WEIGHT=			
	AT	79•00	GFOP KM	TEMP	FRATURF=		65 K		LECULAR	WEIGHT=			
	AT	90.00	GEOM KM		ERATURF=		65 K	AND MC	LECUL AR	WEIGHT=			
	AT	100.00	GEOM KM		FRATURE=		U5 K		LECULAR	WF [GHT=			
	AT	110.00	GEOM KM		EPATURF=		0 K		LECULAR	WFIGHT=			
	AT AT	120.00 150.00	GEOM KM GEOM KM		FRATURF=		49 K		LECUL AR	WF I GHT=			
	- 2†	160.00	GEOM KM		FRATURF=		20 K		DLECHLAR	WFIGHT=			
	ΑŤ	170.00	GEOM KM		FRATURE=	1103			DECULAR	WEIGHT=			
	AT	190.00	GEOM KM		ERATURE=	1205			LECULAR	WE I GHT=			
	AT	230.00	GEOM KM		ERATURE=	1322			DLECHLAD	WF I GHT=			
	AT	300.00	GFOW KM		FRATURF=		10 K		DLECULAR	WF I GHT=	22.658	57	
	AT	400.00	GFON KM		FRATURF=	1487			DLECULAR		19.939		
	AT AT	500 • 00	GEOM KM		ERATURE=		•50 K		DLECHLAR		17.938		
	AT	700.00	GECN KM		ERATURES		•10 K		DLECHLAR	WEIGHT=			
	ÂŤ	1000.00	GEOM KM		ERATURF=		• 60 K		DLECULAR	WFIGHT=	16 • 16A 16 • 000		
				,			- 1. d		PECOLAR	WE + GITT -	11.0000	<u> </u>	-
CALCULA	TED QUA	NTITIES			 								
								MEAN			MEAN		
HEIGHT	TEMP	PRESSURE	DENSITY	SPEED	MOLECULAR	DENS	t UMBER	FPEF	VIS-	Porc	PARTICLE	COLL	COLUMNAR
				OF SOUND	WEIGHT	SCALE	DENSITY	PATH			VELOCITY		MASS
(KM)	(K)	(MB)	(GM/CC)	(M/SEC)		(KM)	(PER CC)	(M)	(F+5)			(PER SEC)	
0	288-1	1.01+03	1.22-03	340.		10.42	2.55+19	6.67-0	8 1.A5	8.43	450.	6.88+09	0.000
5	255 • 7	5.40+02	7.36-04	321•	29.0	9.26	1.53+19	1.11-0			432.	3.90+09	4.821+02
10 15	223.3	2.65+02	4-14-04	300.	29.0	8 • 10	P+60+18	1.98-0				2.04+09	7+635+02
15 20	216.6	1.21+02 5.53+01	1.95-04 8.89-05	295. 295.	29•0 29•0	6 • 37 6 • 38	4.05+18	4.20-0			398.	9.49+08	9+106+02
25	221.6	2.55+01	4.01-05	208.	29.0	6+35	1.85+18 P.33+17	9•19=0 2•04=0			39A. 402•	4.33+08 1.97+08	9.780+02
30	226.5	1.20+01	1.84-05	302.	29.0	6.50	2 • P3+17	4 - 44 - 0				9.17+08	1.009+03 1.022+03
35	236.5	5.75+00	8 • 46-06	308.	29.0	6.47	1.76+17	9.65-0			416.	4.31+07	1.029+03
40	250.4	2 • 87 + 00	4.00-06	317.	29.0	6.86	P+31+16	2.04-0			42P •	2.09+07	1.032+03
45	264.2	1.49+00	1.97-06	326•	29.0	7.25	4.09+16	4-16-0	5 1.70	7.84	439.	1.06+07	1.033+03
50 55	270.6	7.98-01 4.27-01	1.03-06 5.61-07	330.	29.0	8.40	2 • 13 + 16	7.96-0 1.46-0			441.	5.59+06 3.02+06	1.034+03 1.034+03

TABLE IV. - MODEL ATMOSPHERE FOR EARTH - CONTINUED

		. —-				·· ·-							
60	255.8	2.25-01	3.66-07	301.	20.0	A . 10	6.36+15	^•67-Q#	1.65	7+63.	432 •	1.62+96	1 075407
65	239.3	1 - 14 - 31	1.67-97	110.	20.0	8.10	16+15	0.50-04	1.55	7.15	418.	8.53+05	1.035+03
70	219.7	5.52-02	•75-9B	267.	20.0	7.41	1.82+15	0.74-N4	1.84	6.57	401.	4.29±05	1.035+03
75	200.1	2.49-02	4.33-98	214.	29.9	6.70	C. C1+14	1.00-03	1.77	6.00	382.	2.03+05	1_035+03 .
80	180.6	1.04-02	(• UO = 0.8	270.	20.0	6 • 1 2	1.15+14	4.09-03	1.22	5,42	363	8.89+04	1.035+03
85	180.6	4 • 12 = 03	7.95-09	270.	20.0	5.4 *	1.65+14	1.03-02	1.22	5.43	363	3.54+04	1.035+03
90	180.6	1.64-03	3 • 17-C9	270.	29.0	5.40	. 6.50 13	2.58-02	1.22	5.44	363		1.035+03
95	195.3	6.80-04	1.21-09	201.	28.9	5.41	0.50+13	6.74-02	1.30	5.90	372.	1.41+04	1.035+03
100	210.0	3.10-04	4 • 97-10	261.	^n g	5.03	1.04+13	1.64-01	1.70	_ 6.36	_392	5.61+03 2.39+03	1.035+03
110	257.0	7.35-05	4.62-11	324.	58.5	6.06	2.07+12	F - 20-01					_1+035+03 .
120	349.5	2.52-05	6.43-11	320.		8.91	5.22+11	3.25+00	1 • 6 6	7.80	436.	5.32+02	1.035+03
130	531 • 1	1.22-05	7.58-12	472.	27.4	10.62	1.66+11	1.02+01	2•12 2•78	10.96	513.	1.5A+02	1 • 035+03
140	712.2	7-41-06	3.39-12		27.1	14.45	7.54+10	2.25+91		17.11	641.	6.28+01	1+035+03
150	892.8	5.06-06	1.94-12	F13.	26.9	18.20	4.11+17	4.14+01	3.40	23.27	746.	3.31+01	1.035+03
160	1022.2	3.69-06	1.16-12	a.	26.7	23.30	2 62+10	6.49+01	7.00	34.16	A38.	2.03+01	1.035+03
170	1103.4	2.79=06	7.03-13	(^0.	26.4	28.55	1.93+10	9.27+01	4.07		901.	1.39+01	1.035+03
180	1154.5	2-15-06	5.86-13	7:: P •	26.1	72.50	1.35+10	1.26+02	4.23	37.35	041.	1.01+01	1.035+03
190	1205.4	1.68-06	4.35-13	7,7.	25.8	74.46			4 • 33	39.64	968.	7.69+00	1.035+03
200	1234.8	1.33-06	3.32-13	741	25.5	27.72	1.01+10 7.82+09	1.68+02	4.42	41.93	qqu.	5.92+00	1.035+03
210	1264.0	1.06-06	2.56-13	7:4.	25.2	39.10	f • 10+09	2•17+02 2•78+02	4 - 47	43.62		4-66+00	1.035+03
220	1293.2	8.57-67	1.99-13	767	25.0	40.66	# • Inj • Ing	3.54+02	4 - 5 3	45.31		3.70+00	1.035+03
230	1322.3	6.96-07	1.56-13	779.	24.7	42.14	3.21+09		4.58	47.02		2.96+00	_1.035±03
240	1338.1	5.68-07	1.24-13	7:0	24.4	44.40	3.00+Dd	4.46+02	4 • 63	48.72		2.30+0n	1.035+03
250	1353.9	4.67-07	0.07-14	7-9.	24.0	45.75			4.66	50.14		1.95+00	1.035+03
260	1369.6	3.86-07	0.04-14	₹00.	23.7	47.82	2.50+09	6.20+02	4.69	51.57		1.61+00	1.035+03
270	1385.3	3-20-07	6.52-14	A10.	23.4	48.20			4.71	52 99		1.33+00	1.035+03
280	1401.0	2.67-07	5.31-14	628.	23.2	49.56	1.37+00	1.02+03	4.74	54.42		1.10+00	1.035+03
290	1416.6	2.24-07	4.35-14	927.	22.9	50.84	1.14+09	1.023+03	4.77	55.86		9-19-01	1.035+03
300	1432.1	1.58-07	3.58-14	947.	22.7	52.12	c.52+08		4.79	57.30		7.71-01	1.035+03
310	1437.7	1.59-07	2.97-14	254	22.3	54.17	r.n2+0A	1.7 <u>0</u> +03 2.12+03	4.82	. 5º • 74		6.49-01	1.035+03
320	1443.3	1.35-07	2.48-14	962.	25.0	55.31	6.77+08		4.43	Eu • 00		5.51-01	1.035+03
330	1448.9	1.15-07	2.07-14	269.	21.7	56.44	5.74+08	2.51+03	4.84	61.25		4 • 69 - 01	1+035+03
340	1454.4	9.80-08	1.74-14	P77.	21.5	57.50	1.AB+08	2.96+03 3.08+03	4.85	62.51		4.01-01	1.035+03
350	1460.0	8.39-08	1 • 46-14	лец.	21.2	58.73	4 • 1 6 + 0 A	4.08+03	4.86	63.70		3-44-01	1.035+03
360	1465.5	7.20-08	1.24-14	602	20.9	59.88	3.56408	4 • 77+n3	4 - 87	65.04		2.96-01	1.035+03
370	1471.0	6.20-08	1.05-14	890.	20.7	61.03	₹•06+08	5.56+03	4.97			2.55-01	1.035+03
380	1476.5	5.36-08	8.91-15	206.	20.4	62.18	2.63+08		4 - 88	67.50		2.21-01	1.035+03
390	1481.9	4.64-08	7.60-15	713.	20.2	63.3.7	2.27+08	7.46+03		68.86		1.92-01	1.035+03
400	1487.4	4.03-08	p 50-15	920.	19.9	64.49	1.96+08	P+66+03		70.14		1.67-01	1.035+03
410	1488.6	3.51-08	5.59-15	925.	19.7	66.60	1.71+08		4.01	71.43		1.45-01	1.035+03
420	1489.8	3.06-08	4.81-15	931.	19.5	67.69	1.49+08	9.06+03 1.14+04	4.01	72.51		1.27-01	1.035+03
430	1491.0	2.67-08	4.16-15	936.	19.3	68.70	1+30+08	1.21+04	4.91	73.60		<u> 1.11-01</u>	
440	1492.2	2.34-08	3.60-15	042	19.1	69.70	1 • 14 + 08	1.50+04	11.05	74.69		9.78-02	1.035+03
450	1493.3	2.05-08	3 - 12 - 15	947.	19.9	70 • 71	0.95+07		4.02	75.78			. 1+035+03
460	1494.5	1.60-08	2.71-15	053.	18.7	71.72		1.71+04	4.02	76.88		7.58-02	1+035+03
470	1495.7	1.59-08	2 • 36 - 15	0'58	18.5	72.73	P • 74+07	1.04+04	4.92	77.98		6.70-02	1.035+03
480	1496.9	1.40-08	2.06-15	963.	18.3	73.75	7.60+07	2.21+04	4.92	79.0A		5.92-02	1.035+03
490	1498.0	1.24-08	1.80-15	968	18.1	74.77	6.78+07 5.00+07	2.51+04	4 • 93	80.19		_5.25-02	.1.035+03
500	1499.2	1.10-08	1.58-15	974	17.9	75.70	5.29+07	2.04+N4 3.01+00	4.03	A1.29		4.66-02	1.035+03
550	302.7	6 • 06 = n9	6.42-16	901.	17.4	81.76	2.92+07	3 • 21+04	4.03	<u> e2.40</u>		4.14-02	1.035+03
600	1506.1	3.45-09	4.63-16	1007	16.8	25.73	1.66+07	1.02+05	4 - 94	86.56		2.33-02	1.035+03
650	1506.9	2.01-09	2.64-16	1010.	16.5	90.50	0.64+06		4.04	90.77		1.34-02	1.035+03
700	1507.6	1.19-09	1.53-16	1028	16.2	93.60	5.72+06	1.76+05	4.94	94 • 04		7.89-03	1.035+03
750	1507.6	7.15-10	0.20-17	1029.	16.1	98.56		2.07+05	4.04	07.35		_4.73=03	1.035+03
800	1507.6	4.33-10	5.56-17	1030.			3.43+n6	4.05+05	4.94	99.91		2 • 94 - 03	1.035+03
850	1507.6	2.64-10	3.39-17	1031.	16.1	100.13	2+08+06	8.17+05		100.49		1.72-03	1.035+03
900	1507.6	1.62-10	2.08-17				1 • 27 + 06	1-34+06		102.07		1.05-03	1.035+03
950	1507.6	1.01-10		1032.	16.1	103.30	7.P1+05	2 • 18 + 06		103.67		6.48-04	1.035+03
1000	1507.6		1.29-17	1033.	16.0	104.90	4 • A4+05	3.51+06		105.28		4.02-04	1.035+03
		6 • 28 - 11	ۥ02-18	1034.	16.0	106.52	3.02+05	5•63+06		106.90	1/117.	2.51-04	1.035+03

TABLE IV. - MODEL ATMOSPHERE FOR EARTH - CONTINUED

			MODEL ATVESPHERE FOR EARTH						11.5.1962			
CONSTRUCTION PARAMETERS			ENGINEERING UNITS									
SURFACE PRE	SURE = 14.	704 LE/SG IN	SUPFACE	TEMPERATU'S	PF = 518.	7 R	SURFACE DE	MSITY =	2.38-03	SLUG/CII I	· T	
PER CENT CAI	RBON DIOXIDE :	• 0	I'AL FCULA	P WEIGHT :	28.96		SURFACE	GRAVITY	= 32.17	FT/SEC/SI	·c	
									-			
CALCULATED Q	JANTITIES							<u>.</u>				
	EMP PRESSU	(SLUG/	SPEED OF SOUND	SPECIFIC WFIGHT	PRES SCALF		_ NUMBER	VEAN PARTICLE VELOCITY	MEAN FREE PATH	VIS- COSITY	KINFTIC VISC	
(MIL.FT) (R) (LB/S0	IN) CU_FT)	(FT/SEC)		(MIL	FT)	(PFR CU FT)	(FT/SEC)	(FT)	(F+5)		
	18•7 1•47+ 60•2 7•84+		1116.	7.7-02 7.6-02	.028 .025	.034 .030	7•2+23 4•3+23		2 • 2 = 07 3 • 6 = 07	3.87 3.44	1.6-04 2.4-04	
•0328 4	01.9 3.85+ 90.0 1.76+	00 8.03-04	983. 968.	7.6-02 7.6-02	.022	•027 •021	2.4+23		6.5-07 1.4-06	3.05 2.97	3 · 8 + 04 7 · 9 = 04	
	90.0 8.02-		968•	7.6-02	.021	•021	5.2+22		3.0-06	2.97	1.7-03	
	98•8 3•70-		. 979.	7.6-02	.021	.021	2.4+22	1320 •	6.7-06	3+03	3.9-03	
	07•7 1•74- 25•7 8•34-		990 • 1012 •	7•6=02 7•6=02	•022 •023	021	1 • 1 + 22		1.5-05	3.09	A • 6 − 03	
	50.6 4.17-		1041.	7.6-02	.024	•023	5•0+21 2•4+21		3•2-05 6•7-05	3•21 3•38	2 • 0 - 02 4 • 4 - 02	
	75.5 2.16-		1069•	7.6-02	•026	.024	1.2+21	1442	1.4-04	3.55	9.3-02	
	87-2 1-16-		1082	7.5-02	.026	.026	6.0+20	1450.	2.6-04	3 • 6 3	1 • 8=01	
	78 · 1 6 · 20 - 60 · 4 3 · 26 -		1052+	7.5-02	•026 •025	.02P	3.3+20 1.8+20	1410.	4 • 8 - 04 8 • 8 - 04	<u>3</u> .57	3 - 3 - 01	
	30.7 1.66-		1018	7.5-02	.023	027	9-8+19	1372	1.6-03	3.24	5•8-01 1•0+00	
•2297 3	95•4 8•01-	04 1.70-07	075•	7.5-02	.022	•024	5.2+19	1315.	3-1-03	3.01	1.8+00	
	60·2 3·61- 25·2 1·50-		931.	7.5-02	•020	•022	2.6+19	1255•	6.2-03	2.78	3.3+00	
	25•2 1•50- 25•2 5•98-		884 •	7.5-02	.018 .018	.020 .018	1.2+19		1.3-02 3.4-02	2.54	6+6+00 1+6+01	
•2953 3	25•2 2•38-		884 ·	7.4-02	.018	•01B	1.9+18	1192	8.5-N2	2.54	4 • 1 + 0 1	
	51.6 9.86-		920•	7-4-02	-019	•118	7-1+17	1241 •	2-2-01	2.72	1.2+02	
	78.0 4.36- 62.6 1.07-		955•	7.4-02 7.4-02	.021	•019 •023	2.9+17		5-4-01	2.90	3.0+02	
	29.1 3.66		1062 •	7.4-02	•026 •036	•1058	5•9+16 1•5+16	1432 •	2.7+00	3.46	9.4+03	
	56 • 1 1 • 77 =		1549 •	7.4-02	_ •056	035	4.7+15	2102	3.3+01	5.81	3.9+04	
	82.0 1.08-		1791•	7.3-02	•076	•047	2 • 1 + 1 5	2448.	7.4+01	7•10	1 • 1 + 0 5	
	07·0 7·34- 40·0 5·36-		2012•	7.3-02 7.3-02	•097 •112	•060 •077	1.2+15 7.4+14		1.4+02	7.95	2 • 2 + 0 5	
	86·1 4·05-		2154•	7.3-02	•112	.077	7.4+14 5.2+14		2 • 1 + 02 3 • 0 + 02	8•50 8•83	3+8+05 5+7+05	
+5906 20	78-1 3-12-	08 1 • 14 - 12	2323•	7.2-02	•130	•107	3.8+14	3175.	4-1+02	9.04	8.0+05	
	69.7 2.44-		2386 •	7.2-02	-138	• 113	2 • 9 + 1 4	3260.	.5 · 5 + n2.	9.23	1 • 1 + 0 6	
	22.6 1.94- 75.2 1.55-		2430 •	7.2-02	•143	-124	2 • 2 + 1 4	3320•	7+1+02	9.34	1 • 5 + 0 6	
	75•2 1•55- 27•8 1•24-		2473 · 2515 ·	7.2-02	•149 •154	•12° •133	1•7+14_ 1•4+14	3437• 3437•	9.1+02	9•45 9•56	1 • 9 + 0 6 2 • 5 + 0 6	
•7546 23	80 - 1 1 - 01 -	08 3-04-13	2557•	7-1-02	160	-138	1.1+14		1.5+03	9.67	3.2+06	
	08.6 8.25-		2590 •	7-1-02	.165	•146	8.7+13		1.A+03	9.73	4 • 0 + 0 6	

TABLE IV. - MODEL ATMOSPHERE FOR EARTH - CONCLUDED

というなして、 とれて、 とれて、 できるとは、 できるというできる。

•8202	2437 • 0	6.78-09	1.94-13	2622•	7.1-02	.169	.150	7 1417	7507			
•8531		5-60-09	1.56-13	2654.	7-1-02	•174	•150 •154	7:1:13	3583.	2.2+03	9.79	5+1+0
•8859		4 • 65 = 09	1.27-13	2686	7.0-02	.179	•158	5•A+13 4•7±13	3627•	2.7+03 3.3+03	9.84	6 • 3 + 0
•9187	2521.7	3.87-09	1.03-13	2717•	7.0-02	•1º3	•163	3.9+13		4.0+03	9.90	7 - 8 + 0
	2549+8	3 • 25 = 09	8.46-14	2748 •	7.0-02	188	167_		3754.	4.9+03_	_10.01	1.2+0
• 9843		2.73-09	6.96-14	277A.	7.0-02	•193	•171	2.7+13		5.9+03	10.06	1.4+0
1.0171	2587•9	2.31-09	5.78-14	2803.	7.0-02	.197	•178	2.3+13		7.0+03	10.08	1.7+0
1.0499	2597.9	1.96-09	4.81-14	2928 •	6.0-02	.201	·181	1.9+13	3864 •	A • 2+03	10.10	2 • 1 + 0
1.0827	2608+0	1.67-09	4.02-14	2853.	6•9=02	.205	<u>•185</u>	1.6+13	389A ·	9.7+03	10.12	2.5±C
1.1155 1.1483	2618 • 0	1.42-09	3.38-14	2077.	6.9-02	.209	·189	1 • 4 + 1 3	3931 •	1.1+04	10.14	3.0+0
1.1812	2627·9 2637·9	1.22-09	2.84-14	2901•	6.9-02	-213		1.2+13	3964	1.3+04	10.16	3.6+0
1.2140	2647.8	9.00-10	2.411-14	2925•	6•9-02 6•8-02	·218	.196	1 • 0 + 1 3	3097•	1.6+04	10 • 1 P	4.2+0
1.2468		7.78-10	1.73-14	2972.	6.8-02	•222 •226	• 200 • 204	B. 7112		1.8+04	10.20	5 • 0 + 0
1.2796	2667.5	6.73-10	1.48-14	2995•	6.8-02	.230	-208	7.4+12	4061.	2 • 1 + 0 4	10.22	5.9+0
1.3124	2677.3	5.85-10	1.26-14	3618+	6.8-02	.234	•212	5.6+12	4123	2.5+04 2.8+04	10.24	6.9+0
1.3452	2679.5	5.09-10	1.09-14	3036	6.8-02	238	219	4.8+12	4148	3.3+04 _	10.26	8 • 1 + 0
1.3780	2681.6	4.44-10	9.35-15	3054.	6.7-02	•241	222	4.2+12	4173	3.7+04	10.26	9.5+0 1.1+0
1.4108	2683·8	3.88-10	8.08-15	3072	6.7-02	245	225	3.7+12	4198.	4.3+04	10.27	1.3+0
1.4436	2685•9	3.39-10	6.99-15	3090∙	6.7-02	249	-220	3.2+12	4222.	4.9+04	10.27	1.5+0
1.4764	2688.0	2.98-10	6.06-15	3108•	6.7-02	252	232	2.8+12	4246.	5-6+04	10.28	1.7+0
1.5093	2690 • 1	2.62-10	5.27-15	3126+	6.7-02	•256	.235	2.5+12	4270+	6.4+04	10.28	2.0+0
1.5421	2692 • 3	2.30-10	4.59-15	3143.	6.6-02	•259	239	. 2.2+12	4294 •	7.2+04	10.29	2 • 2 + 0
1.5749	2694 • 4	2.03-10	4.00-15	3160•	6 • 6 = 02	•263	.242	1.0+12	431A.	A.2+04	10.29	2.6+0
1.6077	2696 • 5	1.80-10	3.50-15	3177•	6 • 6 = 02	•267	245	1.7+12	4341.	9.3+04	10.29	2.9+0
1.6405 1.8045		1.59-10 8.79-11	3.06-15 1.64-15	3194.	6.6-02	•270	• 240	1.5+12	4364.	1.1+05	10.30	3.4+0
1.9686	2711.0	5.00-11	9.00-16	3250.	6.5-02	•2A4_	•26P	8 • 3 + 11	4441.	1.9+05	10.31	6.3+0
2.1326	2712.3	2.91-11	5.13-16	3340.	6.3-02	.29A	-281	4 • 7 + 1 1	4515•	3-4+05	10.32	1 • 1 + 0
2.2967	2713.7	1.73-11	2.94-16	3374.	6.5-05	310	•297 •307	2 • 7 + 1 1	4563•	5.8+05	10.32	2.0+0
2.4607	2713.7	1.04-11	1.79-16	3377.	6.1-02	•325	323	1 • 6 + 1 1 9 • 7 + 1 0	4610 • 4614 •	9.4+05	10.33	3.5+0
2.6248	2713.7	6.28-12	1.08-16	3380.	6.0-02	•33n	- 320	5.9+10		1•6+06 2•7+06	10.33	5 • 8 + 0
2.7888	2713.7	3-83-12	6.59-17	3703	6.0-02	.335	. 334	3.6+10		4.4+06	10.33 10.33	9+6+0
2.9529	2713.7	2.36-12	4.04-17	3386.	5.0-02	•34n	.330	2.2+10	4626 •	7.1+06	10.33	2.6+1
3.1169	2713•7	1.46-12	2.50-17	3780.	5.8-02	.345	• 344	1.4+10	4630 •	1.2+07	10.33	4 - 1 + 1
												_
	COLUMNAR MASS = 65.968 SLUG/SG FT					PLANETARY PARTUS = 3961.0 MILFS						_
							-					-
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